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GENETIC VARIABILITY ANALYSIS FOR QUANTITATIVE TRAITS IN CHICKPEA (*CICER ARIETINUM* L.)

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ABSTRACT:
The present research work was carried out at Pulses Research Unit, Dr, Panjabrao Deshmukh Krishi Vidyapeeth, Akola during Rabi 2020-21, with forty four genotypes of Chickpea (*Cicer arietinum* L.)" genotypes. in Randomized Block Design with three replications with an aim to determine genetic variability, heritability and expected genetic advance . Analysis of variance indicated that there were significant differences among the genotypes for different morphological characters. The phenotypic coefficient of variation was higher than genotypic coefficient of variation. The high values of GCV and PCV observed for number of secondary branches per plant followed by seed yield per plant, number of pods per plant, seed yield per plot, number of primary branches per plant and plant height. High estimates of heritability in broad sense was recorded for 100 seed weight, seed yield per plant, number of secondary branches per plant, number of pods per plant, number of primary branches per plant, seed yield per plot plant height and days to 50% flowering. Whereas days to maturity express low heritability. High genetic advance was observed for seed yield per plot and, number of pods per plant. However moderate value was recorded for character plant height. Lowest value was genetic advance was recorded for number of primary branches per plant followed by days to maturity, number secondary branches per plant, days to 50% flowering, 100 seed weight, seed yield per plant. The highest estimates of heritability coupled with higher genetic advance as per cent of mean was observed for characters number secondary branches per plant followed by seed yield per plant, number of pods per plant, seed yield per plot and number of primary branches per plant.

Keywords:- Chickpea, morphological characters, .

INTRODUCTION :

Chickpea is the most important pulse or food legume crop in world as well as in India and plays dominant role in agriculture. Pulses in India have been considered as the poor man's source of protein. (Ladizinsky, 1976).

Chickpea is highly nutritious as 100 g of chickpea seeds contain 18-22 g of protein, 61-62 per cent of carbohydrates and 4.5 per cent of fat. As they are high in protein, it make excellent replacement for meat in vegetarian diet.The protein quality of chickpea is greater than any other pulses. Chickpea is rich source of vitamins, minerals like calcium – 280 mg per 100 g, iron 12.3 mg per 100 g, phosphorus 301 mg per 100 g. and fibres, so it may offer benefits such as improving digestion, weight management, etc. It is consumed in the form of processed whole seed. It may be boiled, roasted, fried or steamed, etc. or it may be split into dal or use as a dal flour (besan) (Kumar *et al.*, 2013).

Despite of the nutritional values and economic qualities of chickpea, its per hectare productivity is very low in our country. This is primarily due to poor genetic makeup of the available cultivars (Kumar *et al.*, 2020). For successful hybridization programme the extent of genetic variability is important factor to produce high yielding genotypes.Therefore, the evulation of genetic variability in the base

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population should have to be a prior action in the breeding programme.The genetic variability can be a choice for selecting suitable paraents. Absolute variability in different characters cannot be a decisive factor for deciding as to which character is showing the highest degree of variability. Genotypic coefficient of variation measures the rang of genetic variability existing in various pant characters and provides the comperative measures of adaptability of the varieties.High genetic coefficient of variation indicates high degree of variability.A better assessment of relative amount of heritable portion of variation can be had from heritability estimates .Burton(1952) and Johnson *et al.*(1955a)has suggested that genetic coefficientof variation together with heritability estimates would give the best features of amount of genetic advance to be expected from selection.

MATERIALS AND METHODS :

The experimental material used in the present study comprised of forty four genotypes out of which forty three were collected from International Crops Research Institute for The Semi-Arid Tropics (ICRISAT) and one (1) check was collected from Pulses Research Unit , Dr. Panjabrao Deshmukh Krishi Vidyapeeth , Akola . The experiment was laid down in randomized block design with three replications during *Rabi* season of 2020-21 at Pulses Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeeth , Akola . Each entry was sown in two rows of 4m length with row spacing of 30 cm and plant to plant distance were maintained at 10 cm . The observations were recorded on days to 50 percent fowering, days to maturity, plant height (cm), number of primary branches per plant , number of secondary branches per plant , number of pods per plant , 100 seed weight (g), seed yield per plant (g), seed yield per plot (g). The data so obtained on various characters were subjected to analysis of variance as described by Panse and Sukhatme (1967). Genotypic and phenotypic coefficient of variation were estimated according to by Burton and De vane (1953). The heritability percentage in broad sense was calculated as suggested by Hanson *et al.* (1956).

RESULTS AND DISCUSSION:

The analysis of variance showed highly significant difference among all the traits *viz.*, days to 50 percent 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 and seed yield per plant and seed yield per plot indicating presence of substantial amount of genetic variability in genotypes.

The phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all the characters. The character number of secondary branches per plant exhibited highest genotypic coefficient of variation (47.36 per cent) followed by seed yield per plant (45.44 per cent) , number of pods per plant (44.15 per cent) , seed yield per plot (34.38 percent) , number of primary branches per plant (29.28 per cent) and plant height (20.95 percent). The character 100 seed weight (17.52 per cent) exhibited moderate phenotypic coefficient of variation, while the character days to maturity (1.64 per cent) showed lowest genotypic coefficient of variation followed by days to 50 per cent flowering (8.38 per cent). The phenotypic coefficients of variation was ranged from 3.78 per cent for days to maturity to 48.65 per cent for number of secondary branches per plant. The character number of secondary branches per plant exhibited highest phenotypic coefficient of variation (48.65 per cent) followed by seed yield per plant (46.54 per cent

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) , number of pods per plant (45.44 per cent), seed yield per plot (37.29 per cent), number of primary branches per plant (31.63 per cent) , and plant height (22.82 per cent). The character 100 seed weight (17.56 per cent) exhibited moderate phenotypic coefficient of variation , while the character days to maturity (3.78 per cent)showed lowest phenotypic coefficient of variation followed by days to 50 per cent flowering (9.84 per cent) .

The heritability estimates indicated that different traits showed very wide range of heritability (h^2) from 43.50 per cent for days to maturity to 99.77 percent for 100 seed weight . The considerably high estimates of heritability were obtained for 100 seed weight (99.77 per cent) , seed yield per plant (97.50 per cent) , number of secondary branches per plant (97.35 per cent) , number of pods per plant (97.10 percent) , number of primary branches per plant (92.52 per cent) , seed yield per plot (92.15 per cent) , plant height (91.81 per cent) , days to 50% flowering (85.20 per cent). Days to maturity showed low heritability estimates (43.50 per cent)

The highest magnitude of genetic advance was observed for seed yield per plot (183.62) , followed by number of pods per plant (36.63) , while the character plant height (19.78) showed moderate genetic advance. The lowest magnitudes of genetic advance was reported for number of primary branches per plant (1.15) , followed by days to maturity (1.61) , number of secondary branches per plant (6.90) , days to 50 percent flowering (7.26) , 100 seed weight (8.71), seed yield per plant (8.98).

High estimates of heritability coupled with high genetic advance expressed as per cent of mean observed for number of secondary branches per plant , seed yield per plant , number of pods per plant , for number of primary branches per plant, 100 seed weight , seed yield per plot which give lot of scope for selection in a population for these traits.

Based on the present investigation , it is suggested that the genetic variability reported for different character in relation to yield should be exploited for future genetic improvement in chickpea.

CONCLUSION:

The phenotypic coefficient of variation (PCV) was higher than that of genotypic coefficient of variation (GCV) for all the characters under study. The assessment of genetic parameters like genotypic coefficient of variation , heritability and genetic advance as per cent of mean indicated that selection , must be done in to character.

The highest estimates of heritability was observed for 100 seed weight followed by seed yield per plant, number of secondary branches per plant ,number of pods per plant and number of primary branches per plant. Indicating major role of genotype and ultimately less environmental influence and high heritability suggests that selection would be successful for this trait Number of pods per plant and seed yield per plot showed high heritability with high genetic advance indicating the presence of additive gene action and direct selection for such traits is rewarding in crop improvement

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Table 1 . Analysis of variance for various characters in chickpea genotype

Sr. No.	Characters	Mean sum of Genotypes		
		Replications	Genotypes	Error
	Degree of freedom	2.00 *	43.00	86.00
1.	Days to 50% flowering	0.32	57.97**	6.52
2.	Days to maturity	19.87	23.60**	13.90
3.	Plant height (cm)	21.30	348.59**	20.39
4.	Number of primary branches per plant	0.13	1.15**	0.06
5.	Number of secondary branches per plant	0.20	36.18**	0.65
6.	Number of pods per plant	56.13	1024.78**	19.87
7.	100 seed weight (g)	0.01	53.99**	0.09
8.	Seed yield per plant (g)	2.19	60.75**	0.98
9.	Seed yield per plot (g)	1533.34	29691.53**	1649.75

** **Significance at 1% level**

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Table 2 . Range, mean and estimates of genetic parameters in chickpea genotypes

Sr. No.	Characters	Range		Mean	GCV (%)	PCV (%)	Heritability (bs) (%)	Genetic Advance (GA)	GAM (%)
		Min.	Max.						
1.	Days to 50% flowering	41.00	57.33	49.42	8.38	9.84	85.20	7.26	14.69
2.	Days to maturity	104.67	115.33	109.42	1.64	3.78	43.50	1.61	1.47
3.	Plant height (cm)	27.73	77.33	49.92	20.95	22.82	91.81	19.78	39.63
4.	Number of primary branches per plant	1.07	3.67	2.06	29.28	31.63	92.52	1.15	55.84
5.	Number of secondary branches per plant	3.70	20.53	7.27	47.36	48.65	97.35	6.90	94.98
6.	Number of pods per plant	21.13	84.00	41.46	44.15	45.44	97.10	36.63	88.34
7.	100 seed weight (g)	15.14	35.00	24.20	17.52	17.56	99.77	8.71	35.99
8.	Seed yield per plant (g)	4.15	23.50	9.82	45.44	46.54	97.50	8.98	91.37
9.	Seed yield per plot (g)	143.33	453.33	281.23	34.38	37.29	92.15	183.62	65.29

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