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Morphological variation, growth and yield and character association in various genotypes of chickpea (*Cicer aritinum* L.) under rainfed condition of Bundelkhand Region

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ABSTRACT

Fifteen varieties of chickpea (Cicer aritinum L.) were tested in randomized block design in three replications during Rabi season 2003-04 at Research farm of Bundelkhand University, Jhansi. In experiment significant Variability exists in the base material, correlation coefficient was significant for 79 values out of these 54 values were position and 25 values were negative. BG-1091 performed better than other in respect of 50% flowering, days to maturity while BG-1086 performed with well respect to height. Maximum number of branches, number of pods/plant were found in Pusa-209. Test weight grain/plant, harvest index were maximum in BG-1091 followed by BGD-72, BG-109A and BGD-72 respectively. In case of quantitative characters of chickpea, the protein content and seed hardiness was maximum in varieties/accessions BGD-72 and BG 1095 fifteen varieties were evaluated respect with seed yield / plot. Seed yield production was found to be BGD-72 to was superior for seed yield/plot, seed yield/ha, grain yield/plant, protein content (%) than rest of the varieties.

Key words *:* Morphological variation, Growth, Yield, Quality attribute, Genotypic and Phenotypice correlation, Chickpea.

INTRODUCTION

Chickpea is normally grown under unirrigated condition during rabi season in Bundelkhand region. It occupied area of about 11.2-lakh hectare area with the production of 10.84 lakh metric tones in 2002-03 (Jhansi and Chitrokoot Division). It contributed about 42% in area and production with 963-kg /ha productivity less behind other divisions of states (1). The production and productivity of pulses has not increased markedly in the last 3-4 decades, consequently. The net availability of pulses per capita has declined. Therefore, maximum strides in production of these crops should be made in near future, as human needs will change continuously.

The self-sufficiency in pulse production could not be achieved due to various constrains. In general, they have inherent low yield potential because of the high biological energy required for production. They are less responsive to added doses of inputs, highly susceptible to pest and diseases, severely damaged by storage pests. Among the constraints the non-availability of quality seeds in sufficient quantities and lack of adequate information on improved seed production methods. It is urgently required that release of new varieties for increasing production of pulses as a national priority.

Yield is a complex character and is the final product generated by the ingerited characters that the controlled by polygenes and are markedly influenced by environmental fluctuation. Seed yield in chickpea like any other crop is dependent upon a number of components characters may facilitate the interpretation of result and provide the basis for planning more efficient breeding and seed production programmes. The knowledge on components, contributing to grain yield may be helpful in order to enhance the productivity level. Therefore, for attaining the higher yield level in chickpea the breeder required to simplify this complex situation though handling of the yield components. For this rational approach, it is essential to have greater information on the genetics of yield along with nature and magnitude of association between yield components and their mode of contribution to grain yield. It is difficult to get immediate release of high yielding varieties to achieve this goal; the genetic studies on the different parameters in chickpea need to examine the nature genetic variability, correlation coefficient and varietal differences.

Considering the above facts to estimate the correlation coefficeint, varietal differences of vegetative, yield and qualitative attributes of chickpea under rainfed condition undertaken with 15 varieties with objectives to study the correlation coefficient of various components characters towards seed yield, to find out the varietal differences of vegetative, yield and qualitative attributes.

MATERIAL AND METHODS

Fifteen varieties of chickpea (*Cicer aritinum* L.) were evaluated in randomized block design and replicated thrice during Rabi 2003-04 at Research Farm of Bundelkhand University Jhansi. Each entry was show in 5m X 3m plot at 60 X 15cm spacing. Observations were recorded on randomly selected competitive plants of each entry on days to 50% flowering, maturity, plant height, number of branches per plant, number of pods per plant, test weight, grain seed yield per plant, biological yield per plant, harvest index (%), protein content (%), seed hardiness seed yield per plot and seed yield per hectare. The genotypic and phenotypic correlations among the characters under study were estimated by Searle (1961).

RESULTS AND DISCUSSIONS

Highly significant variances were observed for the different varieties for all the characters. It indicated that significant variability exits in the base materials (Table-1)

Correlation Coefficient

Generally the magnitude of genotypic correlation coefficients was higher than their corresponding phenotypic correlation coefficients. In the present investigation, correlation coefficients were significant for 79 values Out of these 54 values were positive and 25 values were negative. The findings are conformity with the findings of Singh et-at (2001). Constant significant correlations were also observed in both genotypic and phenotypic levels. Positive and significant correlations were recorded for number of branches per plant with grain yield and protein content, 100-seed weight with seed hardiness and seed yield per plant with biological yield per plant, seed yield per plant and seed yield per hectare, biological yield per plant with harvest index and protein content, protein content with seed hardiness, seed yield per plot with seed yield per plot with seed yield per hectare. Significant negative correlation coefficient value were observed for days to 50% flowering with days to maturity, days to maturity with seed yield per plot, plant height with number of branches per plant. Similar results were supported, Singh, et-at, (2001).

Varietal differences based on mean value for different traits:

Days to 50% flowering varied from 45.75 in case of BG-1044 to 75.20 in BG-1091 with an over all mean value of 62.60 days the number of days to maturity was minimum for the BG-1044 and maximum in case of BG-1091 the mean value for days to maturity was 152.53 days, The range of variation for plant height was from 62.6 cm in case in case of Pusa-267 to 80.00 cm in case of BG-1086 with mean value of 72.87 cm. The mean value of the number of branches/plant over all

Table 1: Analysis of variance for different characters of 15 varieties/accessions of chickpea under rainfed condition.

Source of Source of Variation	D.F.	Days to 50% flowering	Days to Maturity	Plant Height	No. of access I per Plant	No. of Pods per Plant.
Replication	2	10.09**	19.50"	15.06"	2.61**	7.06"
Treatment	14	59.52**	68.36**	402.31"	61.53**	118.68**
Error	28	1.08	1.61	1.99	0.17	1.24
C.D.		1.37	1.03	1.57	3.09	1.74

Source of Source of Variation	D.F.	100 seed weight	Grain Yield per plant	Biological Yield per plant	Harvest index
Replication	2	4.34**	15.73"	167.03*	51.91*
Treatment	14	30.31**	364.15**	1686.77"	40.34*
Error	28	0.66	4.34	82.87	24.13
C.D.		2.18	6.79	13.64	10.66

Source of Source of Variation	D.F.	100 seed weight	Grain Yield per plant	Biological Yield per plant	Harvest index
Replication	2	2.60**	1.79*	26.84**	29.95"
Treatment	14	4.30**	3.50**	396.23**	415.75"
Error	28	0.36	0.27	5.68	6.21
C.D.		4.78	4.86	7.87	8.06

*, **, Significant at 5 and 1% levels, respectively.

Table 2 : Phenotypic (upper diagonal) and genotypic (lower diagonal) correlation coefficient among 13 characters in 15 varieties/ accessions of chickpea under rainfed condition.

Characters	Days to 50% flowering	Days to Maturity	Plant height	No. of Branches Per Plant	No. of pods per plant	100 seed weight	Grain yield per plant
Days to 50% flowering	-	-0.358**	-0.015	0.268**	0.038	0.145	0.102
Days to maturity	-0.306**	-	0.139	0.091	-0.045	-0.239*	0.288**
Plant height	-0.268**	0.274**	-	-0.250*	0.087	0.050	-0.106
No. of branches per plant	0.013	-0.035	-0.409"	-	-0.233*	0.068	0.250**
No. of pods per plant	0.103	0.131	0.006	-0.085	-	0.013	0.282**
100 seed weight	0.200	0.261**	0.223*	0.090	0.040	-	0.201
Grain yield per plant	-0.235	-0.279**	-0.546	0.683"	0.139	0.803**	-
Biological yield per plant	0.357**	-0.138	0.839**	0.142	-0.262**	0.267**	0.536**
Harvest index	-0.005	0.100	-0.003	0.504**	0.221*	-0.133	0.260**
Protein content	0.102	-0.006	-0.050	0.226	-0.001	0.240*	0.300**
Seed hardiness	-0.310**	-0.356**	0.003	-0.057	0.089	0.542**	0.201*
Seed yield per plot	-0.311**	-0.280**	0.232*	0.786"	0.034	0.015	0.923**
Seed yield per hectare	-0.356**	-0.534"	-0.119	0.547"	0.214*	0.437**	0.892**

Characters	Biological yield per Plant	Harvest index	Protein Contd.	Seed Hardness	Seed Yield per plot	Seed yield per hectare
Days to 50% flowering	-0.092	0.312**	-0.011	0.221	0.052	-0.013
Days to maturity	0.012	-0.230*	0.139	0.069	-0.212*	0.156
Plant height	-0.219	0.124	-0.240*	-0.310**	0.082	0.211*
No. of branches per plant	0.210*	-0.067	0.252**	0.415**	0.073	0.154
No. of pods per plant	0.072	0.076	-0.259**	0.136	-0.127	-0.108
100 seed weight	0.002	-0.008	0.032	0.589*	0.253**	0.315**
Grain yield per plant	0.262**	0.129	0.001	0.006	0.539**	0.689**
Biological yield per plant	-	0.256**	0.210*	-0.235*	0.049	0.056
Harvest index	0.280**	-	0.065	0.090	0.093	0.102
Protein content	0.360**	0.231*	-	0.782**	0.215*	0.068
Seed hardiness	0.309**	0.312**	0.206*	-	-0.055	0.044
Seed yield per plot	-0.535**	0.092	0.138	-0.088	-	0.856*
Seed yield per hectare	0.359**	0.217*	0.319**	0.156	0.786**	-

*, ** Significant at 5 and 1% levels, respectively.

Table 3 : Mean value of different vegetative character yield characters of 15 varieties/ accessions in chick pea under rained condition.

Variety/ Accession	Days to 50% flowering	Days to Maturity	Plant Height	No. of Branches per Plant	No. of Pods per Plant	100 seed weight (e)	Grain Yield per Plant (g)	Biological Yield per Plant (g)	Harvest Index (%)
BG-2002	58.60	150.50	75.30	14.25	115.40	20.00	45.50	80.60	56.45
BG-1108	50.50	144.00	77.25	12.00	98.25	22.50	40.0	72.50	55.17
BG-1044	45.75	137.25	68.00	08.00	56.50	23.00	25.70	56.00	45.89
Pusa-267	70.00	155.75	62.60	15.50	115.00	15.50	38.00	70.50	53.90
BGD-72	65.25	152.00	64.00	17.50	116.20	28.50	50.00	83.00	60.24
Pusa-244	68.25	154.00	70.50	11.75	100.20	21.00	43.50	75.70	57.46
BG-1100B	69.50	157.50	71.25	15.00	112.50	23.00	45.60	90.50	50.66
pusa-209	69.00	155.00	79.75	21.50	118.00	16.00	43.50	81.50	53.37
Pusa-1088	50.00	148.25	78.25	14.60	108.60	22.20	41.20	78.20	52.68
BG-1091	75.20	162.00	73.50	12.80	95.50	32.00	46.50	86.50	53.75
BG-1086	69.50	154.50	80.00	15.70	112.60	22.50	44.30	85.00	52.11
BG-1095	60.00	151.75	72.40	13.00	109.50	21.75	43.00	75.20	57.18
BG-2001	55.50	152.50	75.50	15.20	110.00	20.00	40.50	90.00	45.00
Pusa-1063	65.00	155.00	76.25	12.75	96.75	20.50	39.00	71.30	54.69
BG-1099A	67.00	158.00	68.50	18.00	112.50	21.00	45.00	95.00	47.36
Grand Mean	62.60	152.53	72.87	14.50	105.17	21.96	42.09	79.43	53.06

Table 4 : Mean values of different qualitative characters & yield characters of 15 varieties/accessions in chickpea under rainfed condition.

Variety/Accession	Protein Content	Seed Hardiness	Yield per Plot	Yield per hectare (kg)
BG-2002	23.00	9.25	3.68	2450.00
BG-1108	21.70	8.90	3.23	2150.00
BG-1044	22.50	8.20	2.39	1590.00
Pusa-267	24.00	9.10	3.08	2050.00
BGD-72	25.00	10.22	4.34	2890.00
Pusa-244	23.50	10.00	3.32	2210.00
BG-1100B	21.90	9.80	3.45	2300.00
Pusa-209	24.00	9.75	3.29	2190.00
Pusa-1088	23.80	8.35	3.43	2285.00
BG-1091	24.50	9.60	4.00	2665.00
BG-1086	21.80	9.95	3.51	2340.00
BG-1095	23.00	10.35	3.39	2260.00
BG-2001	22.30	9.30	3.18	2120.00
Pusa-1063	22.50	10.00	3.5	2100.00
BG-1099A	23.50	8.80	3.57	2380.00
Grand Mean	23.13	9.44	3.40	2265.00

the genotype was 14.5 (Table 3). Maximum numbers of branches/ plants were obtained in the genotype pusa-209 while minimum number of branches/plant were obtained in case BG-1044. Similar observations were recorded by several workers, Yadav et-al (2001), Singh and Gupta, (2002). The number of pods/plant varied from 56.50 in the genotype BG-1044 to 118.00 in the genotype PUsa-209 with over all mean value of 105.17. The range of variation or 100 seed weight was from 15.5 gram in Pusa-267 to 32.00 gram in BG-1091 with an over all mean 21.96 gram the grain yield/plant was the range of 25.7 gram to 46.5 gram with over all mean of 42.09 gram the mean value of biological yield/plant varied from 56 gram in BG-1044 to 95 gram in the genotype BG-1099 A with mean value over all the genotype being 79.43 gram the value of harvest index was in the range of 45.00 to 60.24% with and over all mean of 53.06%. The similar findings were reported by Singh *et.al.* (2001), nath *et.al.*, (2001), Singh and Gupta, (2002).

The protein contents in the different genotypes varied from 21.7% in BG-1108 to 25.00% inBGD-72 with over all mean value of 23.13% the seed hardiness a head minimum value 8.20 in BG-1044 and maximum value of 10.35 in BG-1095 with an over all mean value 9.44 (Table 4). The results were supported by Williams *et.al.*, (1986) and Singh *et. al.* (2001). Finally the maximum yield/plot was obtained for the genotype BGD-72 (4.3 kg) while the minimum value was obtained in the genotype BG-1044 (2.39 kg) the mean value of yield/ plot over all the genotypes was 3.4 kg. the maximum yield/hector was obtained for BG-2002 which give 2450 kg/hectare which the genotype BG-1044 gave minimum yield/hectare (1590 kg/ha). The mean yield/ha was 2265 kg/ha. Similar observations were reported by Nath *et.al.* (2001) Singh, *et. al.*, (2001) and Singh and Gupta (2002).

Analysis of variance

The analysis of variance reveled in inherent differences among the genotype for all the characters highly significant differences were observed for days to 50% flowering, days to maturity, number of branches/plat, number of pods/plant, 100 seed weight and biological yield/plant, protein content seed hardiness and seed yeild/plant.

Correlation Analysis

Significant positive correlation was obtained for days to 50% flowering with no. of branches/plant and harvest index, while with days to maturity it showed significant negative correlation Table 3. The number of days to maturity showed significant positive correlation with grain yield/plant while significant but negative correlation was obtained for 100 seed weight, harvest index, seed yield/plot. The plant height showed highly significant positive correlation with number of days to maturity. The plant height showed significant negative correlation with days to 50% flowering number of branches/plat, protein content and seed hardiness significant positive correlation was obtained for number of branches/plant protein content and seed hardiness significant positive correlation was obtained for number of branches/plant and grain yield/plant, biological yield/plant, protein content and seed hardiness.

The number of pods/plant showed significant positive correlation with grain yield/plant but it showed highly significant and negative correlation with protein content, 100-seed weight showed significant positive correlation with number of days to maturity, plant height, seed hardiness, seed yield/plot and seed yield/ha the grain yield/plant should significant positive correlation with 100 seed weight, biological yield/ plant, seed yield/plot and seed yield/ha. The biological yield/plant showed highly significant positive correlation with number of days to 50% flowering, plant height, 100-seed weight, seed yield/plant, Harvest index and protein content, however it was negatively correlated with seed hardiness. The harvest index showed highly significant positive correlation with no. of branches/plant no. of pods/plant, seed yield/ plant, biological yield/plant. The protein content showed significant positive correlation with 100-seed weight grain yield/plant, biological yield/plant, harvest index, seed hardiness and seed yield/plot. The seed yield/plot was positively correlated seed yield/hectare. The seed yield/ha showed highly significant correlation with number of days to 50% flowering and number of days to maturity while with rest of the characters it showed significant positive correlation.

REFERENCES

Anonymous, (2003). Directorate of Agricultural Pulses Section, Pulses Production Strategies and Possibilities in U.P. Bhawan, Lucknow.

Nath, Omkar; Prakash, B. and Sharma, D.K. (2001). Pace of growth and variability in chickpea production in India. National Symposium on pulses for Sustainable Agriculture and Nutritional Security. April 17-19 at New Delhi. 192-193.

Paroda, R.S. and Joshi, A.B. (1970). Genetics architecture of yield and components in wheat. *Indian J. Genetics*. **30:** 298-314.

Sekhon, H.S. and Singh, Guriqbal (2001). Influence of different environments on the growth and yield of chickpea (Cicer arietinum L.) genotypes. Diamond Jubilee Symposium on Hundred Years of Post-Mendelian Genetics and Plant Breeding-Retrospect and Prospects. Non. 6-9 organised by Indian Society of Genetics and Plant Breeding at New Delhi. 186.

Searle, S.R. (1961). The value of indirect selection I: Mass selection, Biometrics. **21:** 682-702.

Singh, S.P.; Singh B. Kumar, R. (2001). Genotypic and phenotypic coefficient of variability habitability and genetic advance and correlation coefficients related to seed yield and few other quantitative and qualitative characters in chickpea (Cicer arietinum L.). *Progressive Agriculture Journal.* **1 (1);** 27-30.

Singh,S.P. and Gupta, D.K. (2002). to study the seed production of different variety in chickpea under irrigated and non-irrigated conditions. *Progressive Agriculture Journal.* **2 (1) :** 45-49.

Williams, P.C. (1986). Protein estimation by Biuret method. *J. Sci. Food Agric*. **12:** 59-60.

Yadav, S.S; Kumar, J. and Yadav, S.K. (2001). Germplasm enhancement for economically important traits in chickpea. National Symposium on Pulses for sustainable Agriculture and Nutritional Security. April 17-19 at New Delhi. 91-92.

Yadav, V.S. Singh D. Yadav, S.S. and Kumar, J. (2002). correlation and path analysis in chickpea *Indian J. Pulses Res.* **15 (1)** 19-22

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