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Studies on genetic variability, character association and path analysis for yield and its contributing traits in chickpea

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Abstract
Eighty four (84) chickpea genotypes were studied for various yield parameters under field conditions to estimate genetic variability, correlation coefficients and path coefficients. Analysis of variance revealed significant differences between genotypes for nine out of ten traits studied. Maximum variation was recorded for pods per plant followed by plant height, number of secondary branches per plant, number of primary branches per plant, number of seeds per pods. Seed yield was found to have highly significant and positive correlation with number of pods/plant. All the studied traits showed significant differences expect for days to 50% flowering. Mean sum of squares due to genotypes were highly significant for all characters studied indicating the existence of sufficient variability. In general high heritability coupled with high genetic advance was observed for Days to maturity, Plant height (cm), Canopy temperature at vegetative growth (30 days stage), Canopy temperature at reproductive phase (90 days stage), Number of primary branches per plant, Number of secondary branches per plant, Number of pods per plant, Number of seeds per plant, Grain yield per plant (g). Due to strong inherent nature of character, it can be possible to transfer the genetic information from one generation to another and make up the genetically advance chickpea genotypes.

Keywords: Chickpea, genetic variability, correlation

Introduction
Chickpea is the third most important food legumes crop of the world in area (11.55 million hectares) and production (10.46 million tons) [1]. India is a major producer of chickpea in the world which contributes about 8.22 million tons to total chickpea bosket from an area of around 9.19 million ha. The genetic manipulation have been successfully made for shorter crop duration (<100 days), high yield (>2.0 ton/ha). It is a rich source of protein, enrich the soil through biological nitrogen fixation and can sustain under rainfed situation. The genus *Cicer* comprises 43 species which shares 42 wild (34 perennials and 8 annuals) and 1 cultivated species *Cicer arietinum* L. [2, 3]. It is normally self pollinated but 1% cross pollination has also been reported by [4]. In grain legumes like chickpea, narrow genetic variability is limiting factor in achieving high productivity [5]. Therefore, success of any breeding programme in chickpea depends on the quantum of genetic variability, interlinking of quantitative traits and heritability exist in genotypes for exploitation and it also offers better scope criteria for selection to breed high yielding chickpea genotype. The big advantage of developing high yield crop varieties through the inbreeding programs are essential to meet the food demands of ever increasing population. Statistically correlation analysis determines the association of genotypic, phenotypic character with environmental components to reveal the crop yield potential. It also establishes the relation between closely associated characters with seed yield is essential to establish selection criteria. An attempt was therefore made in this study to determine the extent of heritable variation and to judge relative merit of yield factors for genetic amelioration of seed yield in chickpea.

Material and Methods
Eighty four newly bred genotypes of chickpea, collected from different AICRP centers of the country were tested in randomized block design with three replications at Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, College of Agriculture, Gwalior, India during Rabi 2015-2016. Each genotype was grown in three row plots of 5.0m length having row-to-row and plant-to-plant spacing at 30cm and 10cm, in randomized block design.

Five competitive plants were selected randomly from each plot and tagged to record experimental data on Days to 50% flowering, Days to maturity, Plant height (cm), Canopy temperature at vegetative growth (30 days stage), Canopy temperature at reproductive phase (90 days stage), Number of primary branches per plant, Number of secondary branches per plant, Number of pods per plant, Number of seeds per plant, Grain yield per plant (g). Statistical software SPAR 1, developed at Indian Statistical Research Institute, New Delhi was used for the estimation of all the genetic parameters of the present study.

Results and Discussion

Analysis of variance showed significant differences among genotypes for all the traits studied, indicating the presence of wide variability. Mean sum of squares due to genotypes were highly significant for all characters studied indicating the existence of sufficient variability hence, offer good scope for the selection of desirable genotype from present material [6]. In the present study magnitude of variability was high for plant height, number of pods/plant and seed yield/plant whereas it was low for days to 50%flowering, days to maturity and seeds/pod. These results were similar to those reported earlier [7]. The average grain yield/plant was ranged from 10.02 to 21.05 g, and crop duration from 111.5 to 124.5 days (Table 1). Phenotypic coefficient of variation (PCV) varied from 2.34% to 22.46% while genotypic coefficient of variation (GCV) varied from 1.06% to 21.01%. In general PCV values were higher than the corresponding GCV value for all the traits, indicating relatively more influence of the environment on these traits. The present study showed the presence of high to medium genotypic coefficient of variation for plant height, number of pods/plant and seed yield/plant. In general high heritability coupled with high genetic advance was observed for all the characters except days to 50percent flowering, Number of seeds per pod [7, 8].

Table 1: Estimation of range, mean and different genetic parameters for different characters in 84 genotypes of chickpea

S. No	Characters	Mean	Range	PCV (%)	GCV (%)	Broad sense Heritability (%)	Genetic advance	Genetic advance as % of mean
1.	Days to 50% flowering	71.04	67.50-74.50	2.34	1.06	20.4	0.70	0.99
2.	Days to maturity	117.51	111.50-124.50	2.51	1.97	61.5	3.74	3.18
3.	Plant height (cm)	42.92	32.45-53.10	10.20	9.47	86.3	7.78	18.13
4.	Canopy temperature at vegetative growth (30 days stage)	24.75	23.10-26.35	3.23	1.97	37.0	0.61	2.46
5.	Canopy temperature at reproductive phase (90 days stage)	34.53	33.35-36.30	1.49	1.07	51.7	0.55	1.59
6.	primary branches per plant	4.65	3.45-6.10	12.93	11.37	77.3	0.96	20.65
7.	econdary branches per plant	18.33	13.45-22.95	9.96	8.98	81.4	3.06	16.69
8.	Number of pods/plant	36.01	27.50-46.50	14.69	13.66	86.4	9.42	26.16
9.	Number of seeds/pod	1.52	1.15-2.15	18.09	13.12	52.6	0.30	19.74
10.	Grain yield/plant	14.28	10.02-21.05	22.46	21.01	87.5	5.78	40.48

The yield components may not always be independent in their action but may be inter-linked. In order to understand the inter-character associations among different yield contributing characters, it is necessary to interpret correlation in the crop plants. In the present study estimates of genotypic correlations in general were higher than phenotypic correlations (Table 2) and (Table 3). This signify the role of strong inherent association between the studied various characters [9]. In general directions of phenotypic and genotypic correlations were almost same for the most of the character combinations. Seed yield per plant exhibited significant positive correlation with number of pods per plant [7]. Results showed that days to maturity had highly significant positive correlation with plant height. Number of primary branches per plant had significant positive correlation with number of secondary branches per plant. In the study characters like days to 50% flowering, canopy temperature at vegetative growth (30 days stage), canopy temperature at reproductive phase growth (90 days stage) had little or no significant relationship with seed yield.

Path analysis used to elicit the nature of relationship of dependent variable i.e. yield with closely associated independent variables. Therefore in the present study path analysis was used to work out the direct and indirect effects of nine characters on seed yield. High positive direct effect on seed yield was exhibited by number of pods per plant. Arora and Jeena, 1999 and Jain et. al. 2013 reported similar results for number of pods per plant.

Table 2: Estimates of Phenotypic and Genotypic Correlation Coefficient

Characters		Days to maturity	Plant height	Canopy temp. (30 days stage)	Canopy temp. (90 days stage)	No. of primary branches / plant	No. of secondary branches /plant	Number of pods /plant	Number of seeds /pod	Grain yield/ plant
Days to 50% flowering	P	0.142	0.054	-0.178	-0.122	-0.116	-0.067	0.103	0.100	0.121
	G	0.314	0.218	-0.607	-0.021	-0.178	-0.088	0.181	0.249	0.240
Days to maturity	P		0.438**	-0.035	0.127	-0.175	-0.043	-0.145	0.201	-0.149
	G		0.558	0.017	0.157	-0.259	-0.063	-0.213	0.082	-0.183
Plant height	P			-0.126	-0.071	-0.131	0.006	0.037	0.073	-0.031
	G			-0.184	-0.177	-0.159	0.013	0.052	0.046	-0.029
Canopy tem.perature at vegetative growth (30 days stage)	P				0.164	0.057	0.088	0.017	0.015	0.002
	G				0.241	0.142	0.127	-0.088	0.335	-0.105
Canopy temperature at reproductive phase (90 days stage)	P					0.054	0.004	-0.078	0.123	-0.062
	G					0.111	-0.082	-0.105	0.290	-0.111
Number of primary branches per plant	P						0.411**	0.087	0.047	-0.014
	G						0.511	0.110	0.056	-0.018
Number of secondary branches/ plant	P							-0.098	-0.074	-0.410*

	G							-0.095	-0.113	-0.380
Number of pods/plant	P								-0.142	0.935**
	G								-0.137	0.951
Number of seeds/pod	P									-0.089
	G									-0.061

Table 3: Phenotypic path

Characters	Days to 50% flowering	Days to maturity	Plant height	Canopy temp. (30 days stage)	Canopy temp. (90 days stage)	No. of primary branches / plant	No. of secondary branches /plant	Number of pods /plant	Number of seeds /pod	Correlation with yield
Days to 50% flowering	0.006	0.001	-0.005	0.003	-0.001	0.012	0.001	0.098	0.005	0.121
Days to maturity	0.001	0.004	-0.038	0.001	0.001	0.018	0.001	-0.147	0.011	-0.149
Plant height	0.000	0.002	-0.087	0.002	-0.001	0.013	0.000	0.035	0.004	-0.031
Canopy temp. (30 days stage)	-0.001	0.000	0.011	-0.018	0.001	-0.006	-0.002	0.016	0.001	0.002
Canopy temp. (90 days stage)	-0.001	0.001	0.006	-0.003	0.009	-0.005	0.000	-0.075	0.007	-0.062
Number of primary branches/plant	-0.001	-0.001	0.011	-0.001	0.000	-0.102	-0.008	0.083	0.003	-0.014
Number of secondary branches/plant	0.000	0.000	-0.001	-0.002	0.000	-0.042	-0.019	-0.093	-0.004	-0.161
Number of pods/plant	0.001	-0.001	-0.003	0.000	-0.001	-0.009	0.002	0.954	-0.008	0.935
Number of seeds/pod	0.001	0.001	-0.006	0.000	0.001	-0.005	0.001	-0.135	0.054	-0.089

Residual = 0.105

Conclusion

Phenotypic coefficient of variation values were higher than the corresponding genotypic coefficient of variation value for all the traits, indicat influence of the environment on these traits. this indicates that while making selection of genotypes for any breeding programme their phenotypic expression always counts.

References

1. Food and Agricultural Organization of the United Nations. FAO Statistical Databases. Available at http://faostat.fao.orgl FAO, Rome, 2014.
2. Van der Maesen LJG. A monograph on the genus with special references to the chickpea (*Cicer arietinum* L.), its ecology and cultivation. Thesis, Agriculture University Wageningen Medad Landbouwhoge School, Wageningen, 1972, 72-10.
3. Muehlbauer FJ. American Journal of Alternative Agriculture. 1993;11:71-76.
4. Smithson JB, Thompson JA, Summerfield RJ. Chickpea (*Cicer arietinum* L.). In R.J. Summerfield and E.H. Roberts (eds.), Grain Legume Crops. Collins, London, UK, 1985, 312-390.
5. Sachine D, Parhe PN, Harer, Nagawade DR. The Bioscan. 2014;9(2):879-882.
6. Arora PP, Jeena AS. Association analysis for yield and other quantitative traits in chickpea. Agriculture Science Digest. 1999;19:183-186.
7. Babbar, Anita, Vijay Prakash, Prakash Tiwari, Iquebal MA. Genetic variability for chickpea (*Cicer arietinum* L) under late sown conditions. Legume Research. 2012;35(1):1-7
8. Jain Sudhanshu, Shrivastava SC, Indapurkar YM, Yadava HS. Assessment of heritable components in chickpea (*Cicer arietinum* L.) Journal of Food Legumes. 2013;26(3&4):130-133
9. Desai K, Tank CJ, Gami RA, Patel AM, Chauhan RM. Genetic variability in indigenous collection of chickpea (*Cicer arietinum* L.) genotypes for seed yield and quality traits. J Prog. Agr. 2015;9(1&2):59-62.