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GENETIC VARIABILITY AND CHARACTER CORRELATION IN PURE LINES, F_1 AND F_2 PROGENIES OF CHICKPEA (*CICER ARIETINUM* L.)

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Abstract

An investigation was carried out to estimate genetic variability and level of association of grain yield with its various components, separately in 18 parental lines, 28 F_1 and 19 F_2 generations. Highly significant genotypic differences were noted in these populations for characters like plant height, number of primary and secondary branches, pods per plant, 100-seed weight, biological yield, harvest index and grain yield. A comparison between F_1, F_2 and parental lines revealed that the range of inter-genotypic variation for the above mentioned characters in F_1 and F_2 was wider than that of parental lines. Generally the genetic correlation coefficients were greater than those of phenotypic correlations in all the populations. Positive and highly significant genetic correlation of yield with plant height, number of primary and secondary branches, number of pods per plant, 100 seed weight and biological yield was observed in parental lines. In F_1 positive and highly significant correlation of grain yield was observed with number of secondary branches, pods/plant and biological yield, whereas in F_2 number of secondary branches, pods per plant, biological yield and harvest index showed positive and highly significant correlation with grain yield. The pattern and level of association of grain yield with its components and inter-relation of these components differed in some cases between F_1, F_2 and parental genotypes. The correlation of seed yield with pods/plant, biological yield and fruit bearing branches was positive and highly significant in all the three sets of genotypes characterized in this study. On the basis of these results and the results reported in the literature it can be suggested that a chickpea plant with enhanced yield potential can be synthesized through hybridization by combining high number of pods/plant and fruit bearing branches and high biological yield into a single genotype.

Introduction

As a source of vegetable protein, chickpea is cultivated and consumed almost all over the world. It is an extremely important component of rainfed production system of Pakistan. Although breeders have been able in bringing about some improvement in this species through conventional breeding techniques, efforts are required to develop more efficient breeding methods in order to overcome specific problems responsible for low yield. The use of early generation yield data and statistics for the association of plant characters with yield in these generations have received much attention. Such type of study helps to eliminate poor population at early stage provided that there is strong correlation between early and late generation. If the pattern of association does not vary between early and late generation, the criteria for single plant selection from late generations may also be decided on the basis of information on early generations.

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Some early studies revealed that there was strong correlation between early and advance generations and that the performance of future generation can be predicted from early generation (F_2 X F_3) (Auckland & Sing, 1977). Similar results were obtained by Dahiya *et al.*, (1984, 1986) who suggested that selection based on early generation yield testing can be improved by minimizing environmental variability. The inter generation correlation in two crosses of cowpea (F_2-F_3, F_3-F_4) were found to be significant for yield (Virupakshappa, 1984).

Yield is naturally a complex character and is final product of several contributory factors and their interaction. The knowledge of association between yield and yield components provides the basis for planning effective breeding programme for maximum genetic gain. Most of the previous information on yield association with its components and growth attributes have been obtained from homozygous populations. It is realized that the data on these fixed genotypes can not be extrapolated to genotypes in segregating population. It is therefore, important to have information about character correlation on segregating populations where from single plant selection is to be made.

Correlation in segregating populations has been an old subject of study in various crops, however in chickpea such work received attention only recently. Dahiya *et al.*, (1986) made a comparison between various selection criteria from F_3 and F_4 populations and concluded that number of fruiting branches were the most effective selection criteria for yield increase.This was supported by Naidu *et al.*, (1986) and other workers such as Khan & Chaudhry (1975), Katiyar (1979) Salimath & Bahl (1983). The present investigation was undertaken to study the pattern of association between yield and yield components in pure lines, F_1 and F_2 populations separately under same environment and to establish criteria for single plant selection from segregating populations.

Materials and Methods

The experimental material of this study consisted of 18 pure lines, 28 F_1 and 19 F_2 populations. The hybrid populations were developed by crossing these pure lines in various combinations. The crosses were made at NARC and half of the F_1 seeds obtained from each cross were taken to Hill Agricultural Research Station Kaghan for generation enhancement. The F_1, F_2 and parental lines were then evaluated in three separate experiments planted in randomized complete block design with three replications. Each plot consisted 4m long 3 rows with spacing of 30cm between rows and 10cm between plants within row. The experiments were conducted in the experimental field of pulses programme, National Agricultural Research Centre Islamabad during 1994-95. Ten plants of each genotype were randomly selected from all the replications both for parental and F_1 populations at the time of maturity. In the case of F_2 populations, 20 plants were selected for each genotype. Data for plant height, number of primary branches, number of secondary branches, pods per plant, 100-seed weight biological yield, harvest index and grain yield were recorded on individual plants in all F_1, F_2 and parental genotypes. These data were averaged to calculate means of each character for individual genotype. The statistical analysis was performed to determine the significance of differences between mean values (Steel & Torrie, 1960). Genotypic (rg) and phenotypic (rp) correlation coefficients between two characters were determined by the following formulae proposed by Dewy & lu (1959).

$$r_g = \frac{Cov.Gij}{(6gi)\ (6gj)}$$

r_g = genotypic correlation coefficient, Cov.Gij and 6gi and 6gj are estimates of variety components of covariance and variance respectively for trait I and j.

$$R_p = \frac{Mij}{(Mii)\ (Mij)}$$

Mij is the mean product of varieties, Mii and Mij are variety mean squares for trait I and j

Results

The results of analysis of variance and mean performance for yield and yield components in parental genotypes, F_1 and F_2 populations are presented in Table 1, 2 and 3, respectively. These results revealed statistically significant differences between genotypes in F_1, F_2 and parental lines for all the characters studied. Number of pods per plant in parental genotypes ranged from 35.11 to 84.04 against 57.17 to 211.16 in F_1 and 58.4 to 133.67 in F_2. 100 seed weight in parental genotypes, F_1 and F_2 populations ranged from 10.90-29.03, 12.36-35.30 and 13.89-31.46 mg respectively. A considerable variation for harvest index which ranged from 33-49% in parents, 34.50 to 52.4% in F_1 and 29.60 to 56.30 in F_2 was observed. Grain yield of parental genotypes ranged from 4.46 to 18.90mg per plant. Whereas in F_1 and F_2 it ranged from 9.97 to 49.94 and 14.54 to 25.21gm per plant respectively.

Genetic and phenotypic correlation coefficients between various plant characters in parental lines (A), F_1 (B), and F_2 (C) generations are presented in Table 4. Both at genetic and phenotypic level yield was positively and highly significantly correlated with all the characters studied in pure lines except harvest index (0.425). The correlation of yield with this trait was non significant although positive (Table 4A). Negative but non significant genetic correlation in parental lines was observed between plant height and harvest index (-326) and between number of primary branches and harvest index (-339) (Table 4A). The association of yield with secondary branches(.593), number of pods per plant(.728) and biological yield per plant (.885) was positive and highly significant in F_1 populations whereas it was negative (-.406) and significant between yield and 100 seed weight (Table 4B). The study of correlation coefficients in F_2 populations (Table 4C) showed yield to be positively and strongly correlated with number of secondary branches (.717), number of pods per plant (.667), biological yield (.665) and harvest index (.638). Highly significant negative genetic correlation (-664) of yield in F_2 was found only with number of primary branches per plant.

Table 1. Analysis of variance and means for yield and yield related plant characters in 18 pure lines (parental lines) of chickpea.

Genotype	X1	X2	X3	X4	X5	X6	X7	X8
Pk51814	46.53	4.44	28.33	68.22	22.71	34.84	48.50	17.45
Pk51830	48.53	6.00	30.11	55.22	22.02	34.53	42.89	15.29
ILC482	49.00	5.66	24.77	68.00	26.35	48.23	49.06	18.90
F87-508C	50.97	5.11	22.25	60.00	25.29	31.10	45.30	14.53
HG202-6-1	50.27	4.66	21.22	60.22	27.46	33.90	39.85	12.65
PK51860	47.63	5.33	21.10	49.09	25.22	26.27	44.81	13.02
PK1792	52.20	4.88	25.89	69.33	19.44	31.80	33.07	11.59
F84-78C	43.83	4.55	17.00	35.11	17.69	13.83	40.90	5.25
F83-47C	42.83	4.45	24.33	58.66	12.04	23.97	40.81	10.03
ICC13301	37.43	3.00	14.66	37.22	12.19	11.68	45.32	4.46
CA118608	44.10	3.66	13.08	35.44	23.94	17.23	44.18	6.94
CM72	44.35	5.55	13.50	40.22	23.30	23.87	36.99	8.73
ICC13416	46.83	5.77	18.89	38.33	24.70	24.45	44.79	10.81
F85-114C	45.87	7.00	18.88	49.22	27.92	24.59	39.57	11.96
HI-11287	47.87	7.55	15.54	52.00	29.03	30.55	40.52	13.04
ICC13728	43.20	4.00	12.33	51.78	23.72	24.27	46.35	12.74
ICC11514	45.53	4.88	18.89	84.09	22.46	29.56	46.30	12.94
ILC5902	43.10	3.88	18.78	63.44	10.90	25.49	44.61	8.32
MS(V)	37.87**	3.78**	82.81**	564.54**	90.82**	214.92**	49.78**	44.67**
MS(R)	80.28**	0.63	3.17	33.82	10.34	03.95	2.73	07.59
MS(E)	10.11	0.66	9.35	35.54	07.72	22.78	10.55	03.34

XI = Plant height, X2 = No. of primary branches, X3 = No. of secndary branches, X4 = No. of pods/plant, X5 = 100 seeds weight (gm) X6 = biological yield/plant, X7 = Harvex Index (%), X8 = Grain yield/plant (gm).

Discussion

The main objective of plant breeders have been the improvement of yield in various crop plants. The success of a breeder in the achievement of this objective largely depends upon his ability to identify the most appropriate breeding strategy, whereas the knowledge of a plant breeder about a population is an important prerequisite for the identification of this strategy.

Present investigation was made to have information on increase in available genetic variability in F_1 and F_2 populations as compared to that of parental lines. The pattern of correlation and quantitative evaluation of effects of yield components on yield was also investigated to decide a selection criteria applicable in various populations. All the F_1, F_2 and parental genotypes were evaluated in the same year on the same field, the difference between F_1, F_2 and parental populations for character correlation and intergenotypic variation may, therefore, be attributed to genetic rather than environmental differences.

Table 2. Analysis of variance and means for yield and yield related plant characters in 28 F_2 progenies of chickpea.

Genotypes	X1	X2	X3	X4	X5	X6	X7	X8
C11514xIIC482	20.03	5.76	31.89	96.55	19.87	45.58	47.28	21.94
PK51814xHIII287	21.21	4.66	53.00	100.6	23.53	56.47	51.57	22.48
PK51814xHG202-6-1	23.87	5.11	104.55	20.87	48.48	46.72	28.18	28.18
HG202-6-1X (ICC11514 x LC482)	22.77	5.00	49.66	111.86	16.60	58.67	46.70	24.50
HG202-6-1xH11087	55.33	6.50	47.83	123.66	14.12	57.19	50.33	24.16
HI1087xHG202-6-1	52.16	6.72	52.33	125.16	15.08	54.75	49.16	20.19
C141x(ICC11514x1LC3279)	57.16	4.72	62.49	190.33	15.36	68.46	52.42	11.61
(CM72xNEC138-2)xCM72	55.50	6.83	42.50	90.66	23.73	61.99	41.20	28.16
F87-508CxF85-114C	54.30	5.54	37.78	104.55	22.37	57.57	40.50	22.42
HIII287xPK51814	51.50	5.33	33.78	77.89	23.53	62.07	41.99	26.90
50180 x F83-47C	56.14	5.22	43.33	79.50	28.91	58.34	41.30	17.74
ICC11514 x ILC482	55.18	6.11	45.76	89.45	25.63	45.83	42.79	17.11
PK51792xIIC5902	59.50	4.72	39.83	108.33	35.36	61.49	51.93	29.23
AAR192146x1CC13416	62.30	6.11	6.11	46.22	125.55	22.40	63.30	13.73
ICC13728 x CA118608	58.73	6.89	40.44	109.89	23.05	69.16	40.89	28.25
CM72X (CC11514 X ILC482)	57.98	5.33	65.49	211.16	13.43	80.23	44.35	11.49
C727 X CM72	48.16	5.11	71.99	159.50	12.38	107.38	46.74	49.95
HG202-6-1 X PK51830	48.07	2.83	46.33	88.83	17.93	50.90	48.50	21.10
PK52291 X P3-7-1	51	5.67	32.83	116.50	29.08	61.18	47.25	29.82
(ICC11514 X ii C482) X PK51833	44.50	4.83	44.33	108.33	25.3	58.07	52.03	29.93
50264 X PK51832	54.50	4.50	22.83	79.17	26.52	33.82	46.97	9.97
PK51835 X ICC13416	48.53	5.33	36.17	113.67	20.52	52.83	47.20	24.60
(ICC11514 X ILC4882) X CM72	51.83	5.67	33.00	106.17	24.90	62.63	43.07	36.93

Table 2 (Cont'd)

Genotypes	X1	X2	X3	X4	X5	X6	X7	X8
E101 X CM72	59.10	5.33	26.97	103.00	28.68	62.17	52.08	29.80
(CM72 X ICC11514) X ILC482	49.83	5.33	37.50	81.30	23.62	49.57	50.72	16.80
NEC138-2 X ILC4421	46.33	2.83	38.50	95.50	24.47	26.32	39.70	12.85
(ICC1151 X ILC482) X CM72	46.50	4.50	29.67	105.83	24.35	55.63	48.87	29.80
CM72 X (ICC11514 X ILC482)	49.50	4.00	30.57	54.17	20.47	50.45	34.57	24.87
MS (V)	431**	2.96**	402.86**	3142.4*	85.79**	610.47**	63.10**	212.48*
MS (R)	12.75	0.52	58.36	11.92	2.32	0.92	33.82	5.51
MS (E)	4.41	0.49	17.29	44.15	2.61	7.93	11.99	10.21

XI = Plant height, X2 = No. of primary branches, X3 = No. of secondary branches, x4 = No. of pods/ plant, x5 = 100 seeds weight (gm) x6 = biological yield/plant, x7 = Harvex Index (%), X8 = Grain yield/plant (gm).

Table 3. Analysis of variance and means for yield and yield related plant characters in 19 F_2 progenies of chickpea.

Genotypes	X1	X2	X3	X4	X5	X6	X7	X8
(ICC11514XILC482)XHG202-6-1	56.57	6.78	22.76	74.70	19.90	44.50	44.12	18.85
HG202-6-1XH11087	55.55	3.25	33.00	117.35	14.97	48.35	48.5	23.79
HG1087xHG202-6-1	51.46	4.27	25.14	97.16	15.85	43.37	46.75	20.51
C141x(ICC11514xILC3279)	52.71	3.63	18.09	59.19	22.66	34.92	43.62	14.54
(ICC11514XILC3279)xC141	52.26	4.45	21.56	66.18	24.58	39.50	44.20	17.14
(ICM72xC141xNEC138-2)xCM72	51.80	4.43	22.42	81.63	22.10	44.70	45.81	41.66
1-87-508CxF87-114C	53.46	4.87	31.17	83.72	29.70	46.02	46.18	23.94
HH128xPK51814	47.14	3.70	19.24	58.40	26.03	31.56	45.73	15.14
80180xF83-47C	50.49	3.97	19.04	71.61	30.34	49.49	43.64	20.25
ICC11514xIIC482	45.86	4.49	18.58	68.88	24.36	35.09	47.90	17.68
PK51792xIIC5902	52.34	4.33	24.1	74.82	24.61	44.15	42.18	19.84
IIC13416xAAR192146	52.75	3.83	35.42	133.67	13.89	60.46	48.90	24.41
AAR92146xICC13416	48.88	4.47	28.40	103.20	15.54	43.34	43.49	19.00
ICC13728xCA18608	57.33	5.03	35.83	108.80	27.49	57.59	37.26	18.99
PK51833x(ICC11514xILC482)	40.00	3.67	33.66	95.57	30.34	60.69	56.29	25.21
CM72(ICC11514xILC482)	40.85	4.57	22.40	75.76	23.97	42.96	46.53	19.86
PK51860xF840-112C	53.14	4.33	26.54	62.98	31.46	57.86	41.29	23.67
F84-78CxICC13301	46.23	5.57	27.70	72.30	10.20	54.95	29.60	15.60
MS (V)	67.75**	1.87**	104.2**	1410.5**	95.22**	220.3**	85.11**	30.5*
MS (R)	2953	.034	22.34	203.45	27.42	60.32	49.70	33.5
MS (E)	9.60	0.61	15.39	97.85	7.1	54.00	14.30	12.3

X1 = Plant height, X2 = No. of primary branches, X3 = No. of secondary branches, x4 = No. of pods/ plant,\ x5 = 100 seeds weight (gm) x6 = biological yield/plant, x7 = Harvex Index (%), X8 = Grain yield/plant (gm).

Table 4. Genetic (rg) and phenotypic (rp) correlation coefficients between yield and yield components in purelines (A), F1 (B) and F2 (C) populations of chickpea.

Variables			X1	X2	X3	X4	X5	X6	X7	X8
X1	A:	rg	1	0.62**	0.678**	0.467**	0.736**	0.872**	-0.326	0.747**
		rp	1	0.413	0.439	0.436	0.469*	0.574*	-0.148	0.593**
	B:	rg	1	0.216	-0.091	0.177	0.200	0.227	-0.193	0.105
		rp	1	0.225	-0.051	0.173	0.184	0.225	-0.154	0.115
	C:	rg	1	0.325	0.285	0.263	-0.222	0.142	-0.352	0.177
		rp	1	0.107	0.076	0.204	-0.175	0.019	-0.216	-0.042
X2	A:	rg		1	0.166	0.088	0.712**	0.488*	-0.339	0.509*
		rp		1	0.233	0.167	0.549*	0.408	-0.235	0.440
	B:	rg		1	0.031	0.199	-0.072	0.046	-0.017	0.221
		rp		1	0.148	0.129	-0.090	0.278	-0.059	0.196
	C:	rg		1	-0.214	-0.252	-0.054	-0.442	-0.766	-0.665**
		rp		1	0.173	-0.040	-0.030	0.164	-0.243	0.091
X3	A:	rg			1	0.598**	0-0.034	0.618**	0.088	0.675**
		rp			1	0.500	0.009	0.609	-0.006	0.587*
	B:	rg			1	0.755**	-0.663**	0.631**	0.238	0.592**
		rp			1	0.695**	-0.625**	0.574**	0.156	0.551**
	C:	rg			1	0.880	-0.250	0.842	-0.012	0.717**
		rp			1	0.758	-0.159	0.709	0.091	0.580**
X4	A:	rg				1	0.026	0.726**	0.178	0.648**
		rp				1	0.031	0.652**	0.127	0.638**
	B:	rg				1	-0.553**	0.628**	0.355	0.728**
		rp				1	-0.509**	0.595**	0.264	0.665**
	C:	rg				1	-0.621	0.601	0.200	0.667**
		rp				1	-0.487	0.495	0.201	0.495*

Table 4 (Cont'd)

Variables	X1	X2	X3	X4	X5	X6	X7	X8
X5			A:	rg	1	0.508	0.042	0.629**
				rp	1	0.392	0.013	0.474*
			B:	rg	1	-0.362	-0.039	-0.406*
				rp	1	-0.350	-0.026	-0.391*
			C:	rg	1	0.109	0.053	0.027
				rp	1	0.136	0.074	0.109
X6				A:	rg	1	0.262	0.960**
					rp	1	0.079	0.854**
				B:	rg	1	0.123	0.885**
					rp	1	0.074	0.803**
				C:	rg	1	-0.108	0.667**
					rp	1	-0.070	0.645**
X7					A:	rg	1	0.426
						rp	1	0.229
					B:	rg	1	0.289
						rp	1	0.222
					C:	rg	1	0.639**
						rp	1	0.432

X1 = Plant height, X2 = No. of primary branches, X3 = No. of secondary branches, X4 = No. of pods/ plant, X5 = 100 seeds weight (gm) X6 = biological yield/plant, X7 = Harvex Index (%), X8 = Grain yield/plant (gm).

The parents, F_1 and F_2 populations possessed considerable variability for the characters under study. The range between minimum and maximum values of genotypic means for each character in F_1 and F_2 populations was wider than that of parental lines. The greater range of intergenotypic variation in F_1 compared to those of F_2 and parents may be due to positive and negative heterotic effects in various F_1 genotypes. These heterotic effects may have been reduced in F_2 probably because of single generation of selfing. On the other hand, within population, more variation was observed in the case of F_2 because all the plants in F_2 population have different genetic makeup. Whereas in parental lines and F_1 all plants of a population were genetically identical hence within population variation was very little. Highly significant genetic differences for the traits as evaluated in this investigation were reported by Singh (1988), Malik *et al.*, (1988), although in pure lines. The maximum genetic variability was observed for pods per plant in all the populations which is similar to the observation made by Filippetti & Margano (1983). The prevalence of genetic variability observed in the present study provides scope for the identification of better genotypes.

The estimates of correlation coefficients revealed that genetic correlations were higher than phenotypic correlation's for almost all the characters in F_1, F_2 and parental populations. These results are similar to the reports of Rani & Rao (1981), Singh *et al.*, (1985) and Malik *et al.*, (1988) on different crops.

The association between yield and other plant characters in parental genotypes as well as in F_1 and F_2 populations revealed that genetic correlations were greater than phenotypic correlations implying that genetic effects were greater than environmental effects. In parental genotypes all the characters were positively correlated with yield. Positive correlation of yield with number of pods per plant, number of primary branches, number of seeds per plant, 100 seed weight and harvest index have already been reported (Bhall *et al.*, 1976; Singh *et al.*, 1985; Jain *et al.*, 1981; Chaudhry & Khan, 1974). The pattern and level of correlation of yield with its components was different in some cases between F_1, F_2 and parents. All the plant characters in parental genotypes were positively and highly significantly associated with yield. Contrary to that plant height, number of primary branches and harvest index in F_1, whereas plant height and 100 seed weight in F_2 were non significantly correlated with yield. The interrelation of yield components were similar in some cases while they were different in others between F_1, F_2 and parental genotypes. For example the relationship of primary branches with 100 seed weight was significant and positive whereas same association in F_1 and F_2 was negative although non significant. The present investigation revealed that the pattern of association between plant characters may be different in various hybrid populations as compared to that of their parents. This indicates that each of the plant characters positively associated with yield in pure lines may not contribute to yield increase on combining these characters through hybridization. Therefore it is proposed that the criteria for single plant selection from segregating generations should be decided on the basis of correlation information on segregating generations and purelines together.

Genetic correlation of secondary branches, number of pods and biological yield per plant with grain yield was positive in parents, F_1 and F_2 hybrid populations. Positive correlation of yield with fruiting branches (Dhaiya *et al.*, 1986; Naidu *et al.*, 1986),

Table 5. Direct and indirect effects via via various paths of 7 yield characters on the grain yield in pure lines (A), F1 (B) and F2 (C) proginies of chickpea.

Characters		Direct effect	Indirect effect via X1	X2	X3	X4	X5	X6	X7	Total correlation
X1	(A)	0.115	-	0.170	0.258	0.129	0.259	-0.031	-0.153	0.747
	(B)	-0.153	-	0.029	0.034	0.078	-0.013	0.203	-0.015	0.105
	(C)	0.410	-	-0.098	0.044	0.047	0.305	0.966	-0.204	0.177
X2	(A)	0.276	0.071	-	0.063	0.024	0.251	-0.017	-0.159	0.509
	(B)	-0.135	-0.033	-	-0.012	0.088	0.005	0.310	-0.0013	0.221
	(C)	-0.305	0.133	-	0.0331	-0.045	-0.007	-0.03	-0.443	-0.665
X3	(A)	0.381	0.078	0.046	-	0.1644	-0.0119	-0.0242	0.0412	0.675
	(B)	-0.3739	0.014	-0.0042	-	0.3321	0.0422	0.5637	0.0187	0.592
	(C)	-0.154	0.117	0.0653	-	0.1583	-0.034	0.572	-0.007	0.717
X4	(A)	0.2748	0.0539	0.0244	0.2281	-	0.0092	-0.0258	0.0837	0.648
	(B)	0.4397	-0.0271	-0.0269	-0.2825	-	0.0351	0.5617	0.0278	0.728
	(C)	0.1798	0.108	0.0766	-0.1359	-	-0.085	0.4078	0.1158	0.667
X5	(A)	0.3517	0.0849	0.1964	-0.0129	0.0072	-	-0.0181	0.0195	0.629
	(B)	-0.0636	-0.0307	0.0098	0.248	-0.2431	-	-0.3236	-0.0031	-0.406
	(C)	0.1373	-0.0911	0.0164	0.0386	-0.1117	-	0.0074	0.0304	0.027
X6	(A)	-0.0356	0.1006	0.1347	0.2598	0.1996	0.1786	-	0.1226	0.960
	(B)	0.8941	-0.0348	-0.0468	-0.2358	0.2762	0.023	-	0.0096	0.885
	(C)	0.6786	0.0584	0.0135	-0.1301	0.1081	0.0015	-	-0.0633	0.667
X7	(A)	0.4687	0.0376	-0.0935	0.0335	0.0491	0.0147	-0.0093	-	0.426
	(B)	0.0784	0.0296	0.0023	-0.089	0.156	0.0025	0.1098	-	0.289
	(C)	0.5789	-0.1445	0.2335	0.0018	0.036	0.0072	-0.0742	-	0.639

X1 = Plant height, X2 = No. of primary branches, X3 = No. of secondary branches, X4 = No. of pods/ plant, X5 = 100 seeds weight (gm) X6 = biological yield/plant, X7 = Harvex Index (%), X8 = Grain yield/plant (gm).

with pods per plant and seeds per plant (Tomer *et al.*, 1982; Ram *et al.*, 1980; Slimath & Bahl, 1983; Agrawal, 1976) have already been reported in hybrid populations. This indicated that the association of these plant characters in chickpea remained stable across the pure line and hybrid genotypes. Hence it may be recommended that high biological yield and greater number of pods and fruit bearing/secondary branches available in various purelines should be combined through hybridization in a single genotype to enhance yield potential of chickpea. It is also proposed that these parameters be given more importance while making selection from segregating populations.

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