

CORRELATIONS BETWEEN YIELD AND ITS COMPONENTS IN SEGREGATING POPULATIONS OF DIFFERENT GENERATIONS OF CHICKPEA (*CICER ARIETINUM* L.)

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ABSTRACT

The results of an association analysis performed on F_3 to F_6 generations of chickpea indicated that pod and seed number per plant, number of secondary branches and 20 seeds weight had the highest correlation values with yield in all generations. Correlation values for seed yield with pod and seed number increased from F_3 to F_6 . Number of secondary branches and 20-seed weight revealed strong associations with yield per plant in advanced generations.

INTRODUCTION

The progress in breeding of any crop depends on the efficiency of the selection criteria. It is therefore essential to identify the most important plant characters that influence yield. In chickpea, several studies have been conducted to find out the associations between yield and yield components of pure lines, however such information is limited in segregating populations of different generations.

Dahiya *et al.* (1986) suggested that the number of fruiting branches is the most effective selection criterion for yield improvement in segregating populations of chickpea. Selection for pod number and seed weight was also effective. Ram *et al.* (1980) recommended number of pods and seeds per plant as effective measures for selection criteria in F_2 and F_3 generations for seed yield in chickpea. The results obtained from F_1 and F_2 by Katiyar and Singh (1978) for seven characters showed that indirect selection for seed yield through 100-seed weight and number of secondary branches was successful. A negative correlation between yield and number of seeds per pod in the F_3 of two crosses and their reciprocals was reported by Khan and Chaudhary (1975). Katiyar (1979) noted positive correlations between pods per plant and both yield and number of secondary branches per plant in the F_1 and F_2 . The objective of this study was to determine the associations between yield and yield components particularly in segregating populations of F_2 to F_6 generations of chickpea.

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MATERIAL AND METHOD

The unselected F 2, F 3, F 4, F 5, and F 6 populations of nine crosses, namely, RSG 44 × Phule G-7, JG 1265 × 2375, JG 1265 × Phule G-7, Phule G-12 × 2 E, ICCV 6 × 2375, ICCV 6 × JG 315, 2375 × JG 315, Phule G-12 × 64-3, 64-3 × BDN 9-3 and four varieties : Annigeri, K 850, BDN 9-3 and 2375 were planted in a 7 × 7 partially balanced lattice design with four replications at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, India. The 4 row plots of 4.8 m² (4 m × 1.2 m) were used. The row spacing was 30 cm and the plant spacing within the row 10 cm. Farrow irrigation was given on October 18, 1986 and sowing was on October 23, 1986. Two seeds were placed per hill and thinning to one was done after emergence. A second farrow irrigation was given on November 25, 1986 at flowering stage.

Observations were recorded on days to 50% flowering and maturity on a plot basis, while for plant height, number of primary and secondary branches per plant, number of pods and seeds per plant, 20-seeds weight and yield per plant were recorded on five random plants in each replication (20 plants/treatment). Correlations between yield and its components were estimated both for each generation separately and for the combined data, using the formula given by Gomez and Gomez (1984). The observations collected on four varieties were only included in the combined analysis of 49 entries.

RESULTS AND DISCUSSION

The correlation analysis for combined data set of the F 2, F 3, F 4, F 5, and F 6 populations and 4 check varieties indicated that yield per plant had

Table 1. Analysis of relationships among yield components in combined data of F 2, F 3, F 4, F 5, F 6 generations and 4 check varieties (49 entries)

	DF	DM	HGT	PB	SB	PP	SP	20 wt	y/pt
DF	1.00	0.30**	0.09	0.11*	0.13**	0.13**	0.23**	-0.30**	-0.08
DM		1.00	-0.06	0.05	0.10	0.11*	0.22**	-0.34**	-0.07
HGT			1.00	0.03	0.18**	0.13**	0.15**	0.16**	0.23**
PB				1.00	0.19**	0.46**	0.43**	0.06	0.37**
SB					1.00	0.58**	0.51**	0.01	0.56**
PP						1.00	0.91**	0.06	0.72**
SP							1.00	0.19**	0.62**
20 wt.								1.00	0.47**
y/pt									1.00

DF=Days to 50% flowering; DM=Days to maturity; HGT=Plant height;

PB=Primary branches; SB=Secondary branches; PP=Pods per plant;

SP=Seeds per plant; 20 wt=20 seed weight. y/pt=yield per plant.

*=Significant at 5%; **Significant at 1%.

Table 2. Analysis of relationships among yield components in F 2, F 3, F 4, F 5, and F 6 generations

	DF	DM	HGT	PB	SP	PP	SP	20 wt	y/pt
1	2	3	4	5	6	7	8	9	10
F₂ Generation									
DF	1.00	0.90**	-0.09	0.18	0.02	0.14	0.31**	-0.57**	-0.33**
DM		1.00	-0.15	0.11	0.03	0.13	0.31**	0.58**	-0.27**
HGT			1.00	0.21*	0.12	0.23*	0.19	0.25*	0.46**
PB				1.00	0.14	0.55**	0.51**	0.01	0.35**
SB					1.00	0.36**	0.30**	0.86**	0.44**
PP						1.00	0.95**	-0.11	0.52**
SP							1.00	0.29**	0.49**
20 wt								1.00	0.37**
y/pt									1.00
F₃ Generation									
DF	1.00	0.58**	-0.15	0.11	0.27**	0.33**	0.39**	-0.44**	0.04
DM		1.00	-0.13	-0.05	0.09	0.21*	0.33**	-0.48**	-0.03
HGT			1.00	-0.07	0.02	-0.01	0.10	0.19	0.21
PB				1.00	0.32**	0.33**	0.19	0.04	0.22*
SB					1.00	0.70**	0.57**	0.01	0.53**
PP						1.00	0.80**	-0.10	-0.66**
SP							1.00	-0.33**	0.48**
20 wt								1.00	0.42**
y/pt									1.00
F₄ Generation									
DF	1.00	0.25**	0.13	0.06	0.12	0.22*	0.22*	-0.14	0.04
DM		1.00	0.09	0.05	0.09	0.24*	0.28**	-0.15	0.13
HGT			1.00	0.09	0.33**	0.34**	0.34	0.02	0.38**
PB				1.00	0.07	0.28**	0.28**	0.10	0.29**
SB					1.00	0.66**	0.66**	-0.09	0.54**
PP						1.00	0.96**	-0.09	0.74**
SP							1.00	-0.16	0.73**
20 wt								1.00	0.44**
y/pt									1.00
F₅ Generation									
DF	1.00	0.79**	-0.13	0.18	-0.07	0.06	0.05	-0.08	0.03
DM		1.00	-0.13	0.07	-0.01	-0.06	-0.05	-0.05	-0.04
HGT			1.00	-0.01	0.29**	0.12	0.09	0.11	0.14
PB				1.00	0.11	0.57**	0.53**	0.10	0.4**
SB					1.00	0.61**	0.56**	-0.09	0.57**
PP						1.00	0.96**	-0.01	0.85**
SP							1.00	-0.08	0.84**
20 wt								1.00	0.42**
y/pt									1.00

Contd.—

	1	2	3	4	5	6	7	8	9	10
F₁ Generation										
DF	1 00	0.59**	-0.12	-0.11	-0.03	-0.09	0.04	-0.12	-0.07	
DM		1 00	-0.04	-0.02	0.11	-0.12	-0.01	-0.30	-0.06	
HGT			1 00	-0.17	0.10	-0.03	-0.02	0.40 *	0.12	
PB				1 00	0.32**	0.46**	0.45**	0.14	0.47**	
SB					1 00	0.65**	0.64**	0.24*	0.70**	
PP						1 00	0.91**	0.08	0.83**	
SP							1 00	0.05	0.83**	
20 wt								1 00	0.49**	
y/pl										1 00

DF=Days to 50% flowering, DM=Days to maturity, HGT=Plant height, PB=Primary branches, SB=Secondary branches, PP=Pods/plant, SP=Seeds/plant 20 wt=20-seed weight, y/pl=Yield/plant * =Significant at 5%, **Significant at 1%

significant and positive associations with plant height, number of primary and secondary branches, number of pods and seeds per plant and 20-seeds weight. Yield per plant showed no significant associations with days to 50% flowering and maturity (Table 1). The highest positive correlation (0.91**) was between number of pods per plant and number of seeds per plant. These two characters had the highest correlation values with yield per plant as reported by Ram *et al* (1980) and showed significant positive correlations with all other characters studied except seed weight. Most characters showed mutual significant positive correlations.

The correlation values estimated separately for each generation showed that seed yield always had positive and significant associations with number of primary and secondary branches, number of pods and seeds per plant and 20-seeds weight (Table 2). Days to 50% flowering and maturity had negative associations with yield per plant in F₂ but showed no significant association in other generations. The correlation values between yield per plant and number of pods and seeds per plant increased from F₂ to F₅. Similarly, the correlations between yield per plant and both number of secondary branches and 20-seeds weight increased from F₂ to F₆. Twenty-seeds weight did not reveal significant correlations with any of the yield components in the F₄ and F₅. In all generations yield per plant had the highest correlation values with number of pods and seeds per plant and secondary branches. Number of pods per plant showed the highest correlation with number of seeds per plant in all generations. Number of secondary branches had significant positive correlations with numbers of pods and seeds and seed yield per plant in all generations. These results suggest that the characters, number of pods and seeds per plant, secondary branches and 20-seeds weight are the most important yield components in

chickpea, and should be used as selection criteria for seed yield. However, since there are highly significant correlations among numbers of secondary branches, pods and seeds per plant, simultaneous selections for these characters would be useful to increase seed yield.

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