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GENETIC STUDIES ON YIELD AND YIELD COMPONENTS OF CHICKPEA

K. Kanaka Durga, S.S.N. Murthy, Y. Koteswara Rao and M.V. Reddy

Regional Agricultural Research Station,
Lam Farm, Guntur - 522 034, India

ABSTRACT

Genetic variability studies on yield and yield components of chickpea conducted during *rabi*, 2000-2001 revealed maximum variability for branches per plant followed by pods per plant and seed yield. High heritability was noticed for days to 50% flowering and test weight indicating that improvement is possible through direct selection in respect of these traits. High heritability coupled with high genetic advance observed for days to 50% flowering, pods per plant and seed yield indicate additive gene effects. Correlation studies revealed that plant height and pods per plant were significantly and positively correlated with seed yield. Therefore, emphasis should be given to these characters for effective selection.

Chickpea is an important rainfed *rabi* pulse crop of Andhra Pradesh and is extensively cultivated in districts of Prakasam, Kurnool, Cuddapah, Anantapur, Guntur, Ranga Reddy and Medak. Chickpea area is rapidly increasing in Prakasam district as an alternate crop to *rabi* sorghum and tobacco.

The productivity of the crop was 904 kg/ha during 2003-04. Farmers of Andhra Pradesh prefer desi varieties such as Annegiri, Jyothi and ICCC 37. However, kabuli varieties are also gaining importance due to increasing demand. The yield of kabuli is at par with desi varieties. Some of the popular kabuli varieties in the state are LBeG 7, KAK 2, Phule G 95311. To develop early, high yielding, bold seeded desi and kabuli lines suitable for the state, there is a need to study genetic variability and correlation of yield with other yield components. Hence, in the present study, an investigation was carried out to study the genetic variability, correlation and path coefficients among yield and yield components for 122 recombinant inbred lines derived from ICCV 2 and JG 62.

One hundred and twenty six (126) recombinant inbred lines derived from a cross between kabuli variety ICCV 2 and desi JG 62 (ICCV 2 x JG 62) along with six checks (ICCV 10, ICCV 2, ICCC 37, JG 62, ICCV 96029 and Annegiri) were evaluated during *rabi* 2000-01 in three replications at Regional Agricultural Research Station, Lam, Guntur. Each genotype was grown in 4 rows of 4m length each with a row spacing of 30 cm and plant to plant distance of 10 cm. The observations on yield and yield components were recorded on five competitive plants of each genotype in each replication. The phenotypic and genotypic coefficients of variation, heritability and genetic advance were calculated following methods suggested by Johnson *et al.* (1955). Association of yield with yield components and path coefficient analysis were carried out as per Dewey and Lu (1959) by taking seed yield as the dependent variable.

GENETIC PARAMETERS

Variability: A perusal of the data presented in Table 1 revealed that phenotypic variability is more than genotypic variability for the characters under study indicating the influence of environment on the expression of the characters.

More or less similar values for GCV and PCV was reported for days to 50% flowering, days to maturity and test weight (Table 1). Wherein some disparity in GCV and PCV values was noticed for branches per plant, plant height, number of pods and seed yield. This disparity between GCV and PCV observed

Table 1. Mean co-efficients of variability, heritability and genetic advance for various yield and yield components of chickpea

S.No	Characters	Mean	Genotypic coefficient of variability	Phenotypic coefficient of variability	Heritability	Genetic advance
1.	Days to 50% flowering	47.72	17.67	17.89	97.60	17.15
2.	Days to maturity	87.96	5.79	6.68	75.10	9.09
3.	Plant height (cm)	38.23	11.53	14.72	61.40	7.12
4.	Branches per plant (no)	4.28	30.19	35.83	71.00	2.24
5.	Pods per plant (no.)	37.36	27.04	31.06	75.80	18.12
6.	Test weight (g) (100 seed)	22.01	18.43	18.88	95.30	8.16
7.	Seed yield (kg/ha)	417.83	21.15	25.38	69.50	151.75

for these traits could be due to influence of environment. Similar observations were made by Rao (1998).

Maximum variability was observed for branches per plant followed by pods per plant and seed yield. These results are in accordance to Rao (1998) and Singh *et al.* (1997) for some of these traits.

High variability coupled with high heritability play an important role in determining the extent of genetic gain expected under selection. In the present study, high heritability was observed for days to 50% flowering (97.6) followed by test weight (95.3) indicating that improvement can be possible through direct selection in respect of these traits, Kumar *et al.* (1998) also reported high heritability for days to 50% flowering and 100-seed weight while low heritability for grain yield.

High heritability coupled with high genetic advance for these traits indicated additive gene effects. Hence simple selection can be effective for these traits for further improvement.

Of the seven characters studied, reasonably high values of genetic advance (as a percentage of the mean) were noticed for seed yield (15.75) and the results are in accordance to Mathur and Mathur, 1996.

Data on simple correlations (Table 2) revealed that days to 50% flowering had significant positive association with days to maturity, plant height and branches per plant. Similar observations were reported by Arora and Jeena, 1999.

The interplay of characters (Table 3) revealed that pods per pant had the maximum positive direct (0.245) effect on seed yield followed by plant height (0.148) and days to 50% flowering (0.0279) while branches per plant (-0.0086), days to maturity (-0.001) and test weight (-0.0031) and negative direct effect and thus these traits should receive priority during selection. The results are more or less similar to Singh et al., (1999) and Yousefi (1997). The residual effect is 0.9098. Days to 50% flowering and days to maturity has shown indirect effect on seed yield through plant height. Present study further indicated indirect effects of plant height on seed yield through pods per plant, and branches per plant on seed yield through pods per plant and test weight, and pods per plant through test weight.

Thus branches per plant followed by pods per plant and seed yield recorded maximum variability. High heritability was noticed for days to 50% flowering and test weight indicating that improvement is possible through direct selection in respect of these traits. High heritability coupled with high genetic advance observed for days to 50% flowering, pods per plant and seed yield indicate additive gene effects. Correlation studies revealed that of the various yield components, plant height

Table 2. Correlation co-efficient values for various yield components of chickpea

Character	Days to 50% flowering	Days to maturity	Plant height (cm)	Branches per plant (no.)	Pods per plant (no.)	Test weight (g)	Seed yield (kg/ha)
Days to 50% flowering	1.000	0.694*	0.461*	0.378*	-0.097	0.082	0.068
Days to maturity		1.000	0.406*	0.276	-0.172	0.210	0.022
Plant height (cm)			1.000	0.139	0.088	0.440	0.180*
Branches per plant (no)				1.000	0.206*	-0.162	0.073
Pods per plant (no)					1.000	-0.275	0.255*
Test weight (g)						1.000	-0.001
Seed yield (kg/ha)							1.000

* Significant at 5%.

Table 3. Path co-efficients of various yield components contributing towards the association of seed yield

Character	Days to 50% flowering	Days to maturity	Plant height (cm)	Branches per plant (no.)	Pods per plant (no.)	Test weight (g)	Seed yield (kg/ha)
Days to 50% flowering	0.0279	-0.0007	-0.0683	-0.0032	-0.0237	-0.0003	0.0683
Days to maturity	0.0193	-0.0010	0.0601	-0.0024	-0.0421	-0.0006	0.0333
Plant height(cm)	0.0128	-0.0004	0.1481	-0.0012	0.0216	-0.0014	0.1796
Branches per plant(no)	0.0105	-0.0003	0.0205	-0.0086	0.0505	0.0005	0.0732
Pods per plant(no)	-0.0027	0.0002	0.0131	-0.0018	0.2450	0.0008	0.2546
Test weight (g)	0.0023	-0.0002	0.0651	0.0014	-0.0669	-0.0031	-0.0014

Residual effect 0.9098.

and pods per plant are significantly and positively correlated with seed yield. The interplay of characters showed that pods per plant had the maximum positive direct effect on seed yield followed by plant height and days to 50% flowering while branches per plant, days to maturity and test weight had negative direct effect pointing out that proper emphasis should be given to these characters during selection.

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