



## Correlation and Path Analysis in *Kabuli* Chickpea (*Cicer arietinum* L.)

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### ABSTRACT

Thirty genotypes of *Kabuli* chickpea (*Cicer arietinum* L.) were grown during *rabi* 2006-07 and observations were recorded on 11 quantitative traits. Correlation indicated biological yield (g) expressed highest positive significant correlation with seed yield per plant followed by number of pods per plant, 100-seed weight (g), harvest index (%), plant height (cm) and days to maturity. Path coefficient analysis indicated high direct effects of biological yield per plant and harvest index with seed yield per plant. Therefore these characters should receive the highest priority in selecting high yielding plants in chickpea breeding.

**Key words** : Correlation, *Kabuli* Chickpea, Path Analysis

Chickpea is the most important pulse crop of India. *Kabuli* type though much in demand is not much grown here because of its poor yield and relatively higher water requirement. In general these types tend to be semi-erect, but lower yielding under Indian soil conditions. Yield is the multiplicative interaction of its components and among themselves. Selection for yield components is an efficient way of yield improvement for effective selection. It is necessary to know about the association between yield and its components. The present investigation was carried out to generate information about inter relationship of the yield and its components. The path analysis is one effective measure to find out direct and indirect effects of component characters contributing to yield.

### MATERIALS AND METHODS

The material for the investigation comprised of 30 *Kabuli* chickpea genotypes. These genotypes of *Kabuli* chickpea were grown in *rabi* season during 2006-07 in a randomized block design with three replications at Regional Agricultural Research Station Lam, Guntur. Each entry was planted in a single row of 4 m length with a spacing of 30X10 cm. The observations were recorded on ten randomly selected competitive plants in each entry and in each replication on 11 component characters *i.e.*, days to 50% flowering, days to maturity, plant height(cm), number of primary branches per plant, number of secondary branches per plant, number of pods per plant (g), 100-seed weight (g), harvest index (%), biological yield per plant (g), protein content (%) and seed yield per plant (g) and mean values were used for statistical analysis. The analysis of variance

and correlations were calculated for all the pairs of characters. Path analysis was done following the procedure given by Dewey and Lu (1959).

### RESULTS AND DISCUSSION

The results of analysis of variance for 11 characters studied in *Kabuli* genotypes indicated that there was significant differences among all the genotypes studied. The genotypic and phenotypic correlations between different pairs of characters are given in Table 1. The values of genotypic coefficients were generally higher than phenotypic coefficients, revealing the influence of environments on phenotypic expressions. Correlation analysis showed that seed yield per plant had positive and significant correlation with biological yield per plant, number of pods per plant, 100 seed weight (g), harvest index, plant height (cm) and days to maturity both at phenotypic and genotypic levels. Biological yield/plant showed significant and positive correlation with number of pods per plant, plant height. Number of pods per plant showed positive correlation with biological yield per plant, days to maturity, plant height, days to 50% flowering, harvest index and plant height. Plant height showed significant and positive correlation for all the characters except harvest index and protein content. Harvest index showed significant and positive correlation for all the characters except biological yield and protein content. Similar results were reported by Singh *et al.* (1990), Singh *et al.* (1995) and Jeena and Arora (2001). Protein content showed significant positive correlation with days to maturity. Similar results were reported by Singh *et al.* (1990).

Table 1. Genotypic and phenotypic correlations between yield and yield components in *Kabuli* chickpea (*Cicer arietinum* L.)

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	No of primary branches plant <sup>-1</sup>	No.of secondary branches plant <sup>-1</sup>	No.of. Pods plant <sup>-1</sup>	100 seed weight (g)	Harvest index (%)	Biological yield plant <sup>-1</sup> (g)	Protein content (%)	Seed yield plant <sup>-1</sup>
Days to 50% flowering	1.000	0.914**	0.612**	0.489**	-0.578**	0.302**	-0.189	-0.337**	0.244**	0.168	0.108
Days of maturity	0.918**	1.000	0.609**	0.377**	0.588**	0.408***	-0.085	-0.214*	0.329**	0.216**	0.241*
Plant height (cm)	0.654**	0.661**	1.000	0.229**	0.387**	0.373**	0.232*	-0.071	0.486*	0.019	0.404**
No.of.Primary branches plant <sup>-1</sup>	0.578**	0.456**	0.245*	1.000	0.541**	0.0265	-0.350**	-0.614**	0.099	0.023	-0.1611
No.of.Secondary branches plant <sup>-1</sup>	0.608**	0.623**	0.430**	0.632**	1.000	0.1348	-0.272**	-0.382**	0.014	0.052	-0.127
No.of Pods plant <sup>-1</sup>	0.331**	0.445**	0.417**	0.023	0.121	1.000	0.1567	0.2373*	0.762**	0.112	0.787**
100-seed weight (g)	-0.202	-0.095	0.256*	-0.409**	-0.282**	0.162	1.000	0.2946**	0.443**	-0.081	0.493**
Harvest index (%)	-0.39**	-0.238*	-0.113	-0.760**	-0.509**	0.234*	0.364**	1.000	0.109	-0.114	0.485**
Biological yield plant <sup>-1</sup> (g)	0.270**	0.359**	0.553**	0.073	0.014	0.790**	0.478**	0.254*	1.000	-0.1037	0.911**
Protein content (%)	0.193	0.256**	-0.006	-0.023	0.067	0.165	-0.087	-0.105	-0.106	1.000	-0.104
Seed yield per plant <sup>-1</sup> (g)	0.123	0.264**	0.423**	-0.211*	-0.1576	0.785**	0.523**	0.553**	0.943**	-0.090	1.000

\*Significant at 5% level

\*\* Significant at 1% level

Above diagonal values are phenotypic correlation values

Below diagonal values are genotypic correlation values

Table 2. Estimates of direct and indirect effects (phenotypic) of components on yield in *Kabuli* chickpea (*Cicer arietinum* L.)

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	No of primary branches plant <sup>-1</sup>	No.of secondary branches plant <sup>-1</sup>	No.of. Pods plant <sup>-1</sup>	100 seed weight (g)	Harvest index (%)	Biological yield plant <sup>-1</sup> (g)	Protein content (%)
Days to 50% flowering	<b>-0.0239</b>	-0.022	-0.042	-0.012	-0.014	-0.007	0.003	0.008	-0.006	-0.0040
Days of maturity	0.062	<b>0.068</b>	0.041	0.026	0.04	0.028	-0.006	-0.015	0.022	0.0146
Plant height (cm)	-0.0007	-0.007	<b>-0.001</b>	-0.0003	-0.0005	-0.0004	-0.0003	0.0001	-0.0006	0.000
No.of.Primary branches plant <sup>-1</sup>	0.006	-0.005	-0.003	<b>-0.013</b>	-0.007	-0.0003	0.005	0.008	-0.0013	-0.0003
No.of.Secondary branches plant <sup>-1</sup>	-0.014	-0.015	-0.01	-0.013	<b>-0.025</b>	-0.003	0.007	0.01	-0.0004	-0.0013
No.of.Pods plant <sup>-1</sup>	0.024	0.032	0.03	0.0021	0.011	<b>0.079</b>	0.012	0.019	0.060	0.0089
100-seed weight (g)	0.002	-0.001	0.003	-0.005	-0.004	0.002	<b>0.013</b>	0.004	0.006	-0.0011
Harvest index (%)	-0.123	-0.078	-0.026	-0.224	-0.14	0.087	0.107	<b>0.365</b>	0.040	-0.0417
Biological yield plant <sup>-1</sup> (g)	0.193	0.261	0.385	0.079	0.011	0.604	0.35	0.087	<b>0.791</b>	-0.0821
Protein content (%)	0.0004	0.0005	0.000	0.0001	0.0001	0.0003	-0.0002	-0.0003	-0.0003	<b>0.0025</b>
Seed yield per plant (g)	0.108	0.240*	0.404**	-0.161	-0.127	0.788**	0.494**	0.485**	0.912**	-0.1045

\*Significant at 5% level

\*\* Significant at 1% level

Bold diagonal values are direct effects

Residual effect : 0.121

Table 3. Estimates of direct and indirect effects (genotypic) of components on yield in Kabuli chickpea (*Cicer arietinum* L.)

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	No of primary branches plant <sup>-1</sup>	No.of secondary branches plant <sup>-1</sup>	No.of.Pods plant <sup>-1</sup>	100 seed weight (g)	Harvest index (%)	Biological yield plant <sup>-1</sup> (g)	Protein content (%)
Days to 50% flowering	<b>-0.011</b>	-0.009	-0.007	-0.006	-0.006	-0.003	0.0021	0.0041	-0.003	-0.002
Days of maturity	0.108	<b>0.118</b>	0.077	0.053	0.073	0.052	-0.011	-0.028	0.042	0.030
Plant height (cm)	-0.052	-0.053	<b>-0.079</b>	-0.019	-0.034	-0.033	-0.021	0.009	-0.044	0.0005
No.of.Primary branches plant <sup>-1</sup>	-0.061	-0.049	-0.026	<b>-0.106</b>	-0.067	-0.0025	0.044	0.080	-0.007	0.0025
No.of.Secondary branches plant <sup>-1</sup>	-0.005	-0.0058	-0.004	-0.005	<b>-0.009</b>	-0.001	0.003	0.0048	-0.0001	-0.0006
No.of.Pods plant <sup>-1</sup>	0.007	0.009	0.009	0.0005	0.003	<b>0.002</b>	0.004	0.005	0.018	0.0037
100-seed weight (g)	0.002	0.001	-0.003	0.005	0.003	-0.002	<b>-0.012</b>	-0.004	-0.005	0.0010
Harvest index (%)	-0.100	-0.061	-0.029	-0.197	-0.132	0.060	0.094	<b>0.259</b>	0.065	-0.027
Biological yield plant <sup>-1</sup> (g)	0.237	0.315	0.486	0.064	0.012	0.693	0.420	0.223	<b>0.877</b>	-0.0933
Protein content (%)	-0.0009	-0.001	0.000	0.0001	-0.0003	-0.0008	0.0004	0.0005	0.0005	<b>-0.0048</b>
yield per plant (g)	0.1236	0.265*	0.424**	-0.211	-0.158	0.786**	0.524**	0.554*	0.943**	-0.0901

\* Significant at 5% level

\*\* Significant at 1% level

Bold and diagonal values are direct effects

Residual effect:SQRT (1-1.0029)

The path coefficient analysis (Table 2 and 3) based on seed yield plant<sup>-1</sup> as dependent variable revealed that the contribution of all the 10 characters towards total variation in seed yield was 86.45%. The protein content, 100 seed weight, days to 50% flowering, days to maturity, plant height, number of primary branches per plant, number of secondary branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup> and 100 seed weight had the least direct effects and indirect effects *via*, other characters and thus were of least importance as contributors towards seed yield. But biological yield plant<sup>-1</sup> had high direct and positive effect and was followed by harvest index. Further the indirect effects of all the characters *via*, biological yield and harvest index were positive. Similar results were reported by Singh *et al.* (1990), Neter Pal Singh *et al.* (2001) and Jeena and Arora (2002).

From the present study, it may be concluded that biological yield per plant and harvest index are the most important characters to be considered for effective selection of high yielding types in *Kabuli* chickpea.

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