Indian J. Applied & Pure Bio. Vol. 30(1), 97-100 (2015).

Interrelationship among yield and yield contributing traits in RILs and their parents in Chickpea (*Cicer arietinum* L.)

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Abstract

Two hundred fifty two recombinant inbred lines generated from diverse *Desi* (ICC 283) and *Kabuli* (ICC 8261) parents were grown in RBD during *rabi* 2011-12 and interrelationship amongst yield traits was worked out. Seed yield showed positive association with biological yield, harvest index & plant height and negative with days to 50% flowering & days to maturity. Good plant vigour with high biological yield & plant height directly affect the yield. Long reproductive phase influence the high sink transfer and resulted high harvest index. Late flowering and late maturity observed in prostrate and spreading plant growth habit bearing RILs showed negative association with seed yield. The path analysis showed biological yield, plant height and harvest index is directly contributing to seed yield but delayed flowering and maturity increase vegetative period and reduce reproductive phase specially in prostrate and spreading plant growth habits bearing RILs showed negative indirect effect on seed yield.

Key words : RILs, Desi gram ICC283, Kabuli ICC8261, Biological yield.

Chickpea [*Cicer arietinum* L.] is an important pulse crop of Indian diet in the predominant vegetarian society. It is also a rich source of protein, enrich the soil through biological nitrogen fixation and can sustain under rain fed situation. Correlation coefficient and path analysis is a statistical measure, which is used to find out the degree and direction of relationship among variables. The RILs generated from recombination of *desi* and *kabuli* type vary in plant growth habit, seed shape, seed size and quantitative yield traits have been used in study to work out relationship among yield traits.

The investigation was carried out during spring 2011-12 at research area of All India Coordinated Research Project on Chickpea, R.A.K. College of Agriculture, Sehore (M.P.). The experimental material consisted of two

hundred fifty two intra-specific recombinant inbred lines (RILs) derived from two contrast parents ICC 283 and ICC 8261. The recombinant inbred line and their parents were sown in randomized complete block design with two replications. Plant growth habit, reproductive phase and yield traits recorded. Using Johnson *et al.*[5] for correlation and Dewey and Lu[2] model for calculation.

The values of phenotypic correlation coefficient and path analysis amongst yield and its attributes obtained have been presented in Table 1 and Table 2. Seed yield per plant showed significant and positive correlation with plant height, biological yield per plant and harvest index. However, it had significant and negative correlation with days to 50% flowering and days to maturity (Table 1). Days to 50% flowering showed positive significant association with days to maturity and negative correlation with biological yield per plant and harvest index. Days to maturity had significant correlation with days to 50% flowering, plant height and 100-seed weight and negative correlation with biological yield per plant and harvest index. Plant height showed significant and positive correlation with days to maturity, biological yield per plant and 100-seed weight but negative correlation with harvest index. Biological yield per plant showed positive significant correlation with plant height and 100-seed weight, however it had significant and negative correlation with days to flowering and days to maturity. Harvest index showed significant and positive correlation with seed yield per plant and negative correlation with days to flowering, days to maturity and harvest index. Hundred seed weight was found to be significantly correlated with plant height, days to maturity and biological yield per plant (Table 1). The seed yield had positive correlation with biological yield per plant, harvest index and plant height while seed yield was found to have negative correlation with days to 50% flowering and days to maturity (Table 1). Bold seed size/ weight was associated with long maturity duration, plant height and biological yield. Early flowering behaviour reduces vegetative phase and early maturity which reduces the overall life cycle period hence, similar results appeared in this investigation where biological yield showed negative association with days to flowering and days to maturity.

Table 1. Phenotypic correlation coefficient amongst seed yield and yield attributes in RILs & parents

S. No.	Traits	Days to 50% flowering	Days to maturity	Plant height (cm)	Biological yield / plant (g)	Harvest index (%)	100-Seed weight (g)	Seed yield / plant (g)
1	Days to 50% flowering	**1.0000**	**		(-)**	(-)**		(-)**
2	Days to maturity	0.5133**	**1.0000**	**	(-)*	(-)**	*	(-)**
3	Plant height (cm)	0.0927	0.2847**	**1.0000**	**	(-)*	**	*
4	Biological yield / plant (g)	-0.2267**	-0.1779*	0.3103**	**1.0000**		*	**
5	Harvest index (%)	-0.2605**	-0.2416**	-0.1557*	0.1126	**1.0000**		
6	100- Seed weight	-0.0125	0.1244*	0.4477**	0.1440*	0.0212	**1.0000**	****
7	Seed yield / plant (g)	-0.3325**	-0.2825**	0.1222*	0.7652**	0.7024**	0.0902	**1.000**

Significant at 5% level of significance* * Significant at 1% level of significance*

High vegetative growth is always positively associated with plant height, seed size and biological yield. RILs generated from crossing of two contrast *desi* (ICC 283) and *kabuli* (ICC 8261) parents showed variation in plant growth habit 3.2% prostrate 37.3% semi-spreading, 44.8% spreading, 14.7% semi-erect RILs recorded which indicates the presence of trangessive segregation. Prostrate plant growth habit is a trait present in wild relatives with long maturity duration and low productivity. Long flowering period high vegetative growth and small reproductive period that resulted poor yield and low harvest index as it was observed in the investigation. High biological yield promoted high sink transfer and resulted high seed yield. Other studies confirming the present findings include Erman *et al.*,[3] who reported correlation between seed yield and pods per plant, seeds per plant, seed weight and number of branches. Kumar *et al.*,[6] and Nanda Qureshi *et al.*,[9] reported significant association of seed yield with pods and grain weight per plant, similarly the grain weight per plant was also associated with number of pods per plant. However, the days to maturity showed positive association with plant height. Ciftci *et al.*[1] reported positive and significant relationship among seed yield and plant height, number of branches, number of pods per plant, biological yield, harvest index and 100-seed weight. Farshadfar and Farshadfar[4] reported significant association of seed yield with number of pods. In 126 RILs Sidramappa *et al.*,[10] observed seed yield had positive correlation with pods per plant, plant height, number of branches, 100-seed weight, reproductive period and days to maturity.

Path coefficient analysis was performed taking seed yield as a dependent variable and direct and indirect effects of yield traits on seed yield have been presented in Table 2. Biological yield per plant showed highest direct effect on seed yield followed by harvest index. Seed yield was positively correlated with plant height and it is due to indirect effect of plant height via biological yield. Days to 50% flowering had negative indirect effect on seed yield via biological yield and harvest index. Similar trend was also observed in days to maturity. Days to maturity showed negative association with seed yield because of negative indirect effect via biological yield followed by harvest index on seed yield. (Table 2).

Simple correlation provides a relationship between traits but path analysis helps to give clear picture or cause of association between traits. In this investigation path analysis was done by taking seed yield as a dependent variable. The positive and negative significant correlation of seed yield with other yield traits was analyzed to get clear picture of direct and indirect selection criteria. Seed yield was found to be positively associated with biological yield and harvest index. Hence can infer that main cause of positive association was direct effect of biological yield and harvest index on seed yield. Plant height also showed positive association with yield but it was due to indirect effect through biological yield. Direct effect of days to flowering and days to maturity on seed yield was very low. The negative significant association of days to flowering and days to maturity with seed yield was due to high negative indirect effect days to flowering and days to maturity via biological yield and harvest index on seed yield. High negative effect of biological yield on seed yield, clearly indicating that late flowering helps in high biomass production but poor pod filling period and low sink transfer. Phadnis *et al.*,[8] reported that seed weight had direct effect on seed yield in 45

Table 2: Path analysis showing direct and indirect effects of yield contributing traits on seed yield in RILs and parents

S. No.	Yield traits	Days to 50% flowering	Days to maturity	Plant height (cm)	Biological yield / plant (g)	Harvest index (%)	100-Seed weight (g)
1	Days to 50% flowering	**0.0120**	-0.0061	-0.0011	0.0027	0.0031	0.0001
2	Days to maturity	0.0030	**-0.0059**	-0.0017	0.0011	0.0014	-0.0007
3	Plant height (cm)	0.0007	0.0021	**0.0073**	0.0023	-0.0011	0.0033
4	Biological yield / plant (g)	-0.1562	-0.1226	0.2138	**0.6890**	0.0776	0.0992
5	Harvest index (%)	-0.1619	-0.1501	-0.0967	0.0699	**0.6214**	-0.0132
6	100 Seed weight	0.001	0.0002	0.0007	0.0002	0.001	**0.0015**
Correlation of Seed yield with yield traits		**(-) 0.3325****	**(-) 0.2825****	**0.1222***	**0.7652****	**0.7024****	**0.0902**

Note: Diagonal value showing direct effect of yield traits on seed yield
Correlation coefficient *Significant at 5% level of significance
** Significant at 1% level of significance

chickpea lines. Qureshi *et al.*,[9] found strong direct effects of biological yield, harvest index and number of seeds per plant on the seed yield in 14 chickpea cultivars. Farshadfar and Farshadfar reported that pod numbers, seed numbers and 100-seed weight had highest direct effect on seed yield in chickpea germplasm. Sidramappa *et al.*,[10] reported number of pods per plant had highest direct effect on seed yield in 126 RILs derived from ICCV 2 x JG 62.

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