International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 511-513

Received: 01-05-2019
Accepted: 05-06-2019

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Relationship among the yield contributing characters and with seed yield in pigeonpea (C*ajanus cajan* (L.) millsp.)

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Abstract
Twenty CGMS-based pigeonpea [*Cajanus cajan* (L.) Millsp.] hybrids were evaluated along with parents and standard check (Maruthi) to study the nature and magnitude of relationship of important agronomic traits with seed yield. The association studies indicated significant positive correlation of seed yield with all characters in parents and crosses except 100-seed weight (g), seed protein (%).

Keywords: correlation coefficient, yield, pigeonpea

Introduction
Pigeonpea [*Cajanus cajan* (L.) Millspaugh] is an important pulse crop of rainfed and semi-arid regions of Asia, Africa and the Caribbean islands. India accounts for over 85% of the global area of 4.6 million hectares. Globally, it is grown under low input environments, primarily as an intercrop with early maturing cereals. Pigeonpea is a major protein supplement for small holding farming families. Pigeonpea is also known for improving soil nutrition by fixing atmospheric nitrogen, releasing soil-bound phosphorus and recycling micro-nutrients. Its extensive root mass and leaf fall are known for improving soil structure and water infiltration in the soil.

Material and Methods
The present study involved five lines, four testers and their 20 F_1's of pigeonpea obtained by L x T mating design (Kempthorne 1957) [1] along with a standard check (Maruthi) at ICRISAT, Hyderabad, Telangana during *kharif*, 2016. Crop sown on 25th July, 2016 in a randomized block design with three replications. Each entry was grown in four rows of 4m length in each plot. The spacing adopted between rows to row was 75 cm and 30 cm between plant to plant within a row. Five plants were tagged randomly for recording the observations on 11 characters viz., days to 50% flowering, days to 75% maturity, plant height, primary branches per plant, secondary branches per plant, pods per plant, seeds per pod, 100-seed weight, harvest index, seed protein and seed yield per plant. Genotypic and phenotypic correlation coefficients were calculated using the method given by Jhonson (1955) [3].

Results and Discussion
Phenotypic and genotypic correlation coefficients between yield and its components in parents and crosses were presented in Table 1 and Table 2 respectively. The present investigation that highly significant and positive association of pods per plant, days to 50% flowering, days to 75% maturity, plant height, primary branches per plant, pods per plant, seeds per pod, harvest index with seed yield per plant in parents and crosses. Similar results were reported by Asawa *et al*. (1981) [5], Natarajan *et al*. (1990) [2], Paul and Upadhaya (1991) [7], Dhameliya and Pathak (1994) [7], Deshmukh *et al*. (2000) [9] and Baskaran and Mutiah (2007) [6].

Seed protein had non-significant and positive association with seed yield in parents and crosses (Devi *et al.* 2012) [4]. The positive and non-significant association of secondary branches per plant with seed yield in parents became positive and significant in crosses.

Non-significant and positive associations observed among the yield components in parents *viz*., were secondary branches per plant with pods per plant become significant and positive in

Crosses. The positive and significant association in parents between character pairs viz., plant height with primary branches per plant; days to 75% maturity with pods per plant and seeds per pod; days to 75% maturity, plant height, primary branches per plant, seeds per pod with harvest index; seeds per pod with pods per plant, primary branches per plant and seed protein with secondary branches per plant became non-significant in crosses.

Negative and significant association of among character pairs in parents became negative and significant in crosses *viz.*, 100-seed weight with plant height and harvest index. Negative non-significant association of 100-seed weight with primary branches per plant in parents became negative and significant in crosses.

Positive and non-significant association of harvest index with seed protein and seed protein with primary branches per plant in parents became negative and non-significant in crosses. Negative and non-significant association of 100-seed weight with days to 75% maturity in parents became Positive and non-significant in crosses. These changes in correlations between pairs of characters in parents and crosses might have resulted due to the modifications in the linkages as a result of re-combinations in the populations.

In general, the yield component traits which showed significant and positive association with seed yield in parents and crosses are of prime importance in determining the seed yield. Such a situation is favourable to a plant breeder as it helps in simultaneous improvement of the characters along with seed yield per se. Hence, the emphasis should be given on days to 50% flowering, days to 75% maturity, plant height, primary branches per plant, pods per plant, seeds per pod and harvest index for obtaining higher yield in pigeonpea.

Table 1: Correlation coefficients for yield and yield components in parents of pigeonpea

Characters		Days 50% to flowering	Days to 75% maturity	Plant height (cm)	Primary branches per plant	Secondary branches per plant	Number of pods per plant	Number of seeds per pod	100-seed weight (g)	Harvest index (%)	Seed protein (%)	Seed yield per plant (g)
Days 50% to flowering	P	1.0000	0.913**	0.788**	0.729**	0.425*	0.832**	0.602**	-0.541**	0.892**	0.268	0.798**
	G	1.0000	0.936**	0.803**	0.844**	0.439*	0.844**	0.682**	-0.689**	0.910**	0.418*	0.811**
Days to 75% maturity	P		1.0000	0.759**	0.675**	0.363	0.843**	0.461*	-0.313	0.822**	0.140	0.845**
	G		1.0000	0.755**	0.805**	0.377*	0.858**	0.527**	-0.429*	0.839**	0.258	0.859**
Plant height (cm)	P			1.0000	0.682**	0.681**	0.700**	0.656**	-0.622**	0.792**	0.312	0.684**
	G			1.0000	0.801**	0.695**	0.702**	0.705**	-0.804**	0.799**	0.424*	0.685**
Primary branches per plant	P				1.0000	0.653**	0.496**	0.509**	-0.331	0.462*	0.354	0.494**
	G				1.0000	0.767**	0.585**	0.712**	-0.486**	0.567**	0.445*	0.587**
Secondary branches per plant	P					1.0000	0.134	0.376*	-0.369*	0.303	0.379*	0.122
	G					1.0000	0.136	0.406*	-0.428*	0.315	0.619**	0.126
Number of pods per plant	P						1.0000	0.477**	-0.456*	0.857**	0.206	0.987**
	G						1.0000	0.511**	-0.584**	0.861**	0.301	0.987**
Number of seeds per pod	P							1.0000	-0.451*	0.551**	-0.015	0.428*
	G							1.0000	-0.735**	0.576**	-0.185	0.455*
100-seed weight (g)	P								1.0000	-0.608**	-0.324	-0.402*
	G								1.0000	-0.809**	0.717**	-0.520**
Harvest index (%)	P									1.0000	0.260	0.799**
	G									1.0000	0.384*	0.801**
Seed protein (%)	P										1.0000	0.197
	G										1.0000	0.283
Seed yield per plant (g)	P											1.0000
	G											1.0000

** Significant at 0.01; * Significant at 0.05

Table 2: Correlation coefficients for yield and yield components in crosses of pigeonpea

Characters		Days 50% to flowering	Days to 75% maturity	Plant height (cm)	Primary branches per plant	Secondary branches per plant	Number of pods per plant	Number of seeds per pod	100-seed weight (g)	Harvest index (%)	Seed protein (%)	Seed yield per plant (g)
Days 50% to flowering	P	1.0000	0.417**	0.436**	0.508**	0.397**	0.448**	0.486**	-0.360**	0.369**	-0.070	0.543**
	G	1.0000	0.484**	0.473**	0.653**	0.422**	0.467**	0.563**	-0.491**	0.391**	-0.076	0.569**
Days to 75% maturity	P		1.0000	0.401**	0.279*	0.072	0.153	0.073	0.002	0.170	0.072	0.264*
	G		1.0000	0.438**	0.396**	0.097	0.165	0.089	-0.048	0.190	0.005	0.282*
Plant height (cm)	P			1.0000	0.228	0.335**	0.450**	0.434**	-0.252	0.234	0.107	0.521**
	G			1.0000	0.250	0.343**	0.457**	0.456**	-0.358**	0.238	0.180	0.528**
Primary branches per plant	P				1.0000	0.597**	0.419**	0.172	-0.475**	0.240	-0.060	0.430**
	G				1.0000	0.677**	0.503**	0.210	-0.739**	0.280*	-0.002	0.519**
Secondary branches per plant	P					1.0000	0.627**	0.261*	-0.605**	0.181	0.241	0.608**
	G					1.0000	0.645**	0.286*	-0.766**	0.188	0.537**	0.627**
Number of pods per plant	P						1.0000	0.193	-0.509**	0.491**	0.241	0.933**
	G						1.0000	0.205	-0.682**	0.495**	0.461**	0.933**
Number of seeds per pod	P							1.0000	-0.255*	0.194	-0.075	0.274*
	G							1.0000	-0.367**	0.209	-0.101	0.294*
100-seed weight (g)	P								1.0000	-0.194	-0.037	-0.524**
	G								1.0000	-0.257*	-0.553**	-0.702**
Harvest index (%)	P									1.0000	-0.147	0.710**
	G									1.0000	-0.303*	0.714**

Seed protein (%)	P G										1.0000 1.0000	0.163 0.299*
Seed yield per plant (g)	P G											1.0000 1.0000

** Significant at 0.01; * Significant at 0.05

Conclusion

Character association studies revealed that selection based on all the characters except secondary branches per plant, seed protein, 100-seed weight in parents and seed protein, 100-seed weight in hybrids will be effective for bringing improvement in seed yield as they had significant and positive correlation with seed yield per plant.

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