

Association between yield and yield attributes in pigeonpea hybrids

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Abstract: Sixteen long duration pigeonpea hybrids were evaluated for association between yield and yield attributes at genotypic and phenotypic level. Positive and significant correlations were observed for yield with number of primary and secondary branches, pods and seed yield plant⁻¹ and seeds pod⁻¹ at genotypic level in *Kharif* crop, whereas in *pre-rabi* crop, positive correlations were observed for seed yield plot⁻¹, with seed yield plant⁻¹ at both genotypic and phenotypic levels. The crop season, i.e., *kharif* and *pre-rabi* showed positive and significant association between plant height at initial flowering, maturity and harvest index. (*Key words:* Association, Pigeonpea hybrids, *Kharif* and *pre-rabi*).

Inter-relationship between various agronomic traits are of interest to the plant breeder, not only from a theoretical consideration of the quantitative inheritance of the characters, but also from a practical view point. Selection is usually concerned with change in two or more characters simultaneously, so that information may be used in the prediction of correlated response to directional selection, in the construction of selection indices and in the direction of same characters which may have no value themselves, but are useful as indicators of the more important ones under consideration (Robinson *et al.* 1951, and Johnson *et al.* 1957). For selection purposes phenotypic correlation is of little practical value unless genotypic and environmental correlation between pairs of traits are in same direction when estimated separately. Genotypic correlations provide a measure of genetic association between characters and is generally used in selecting for one character as means for improving another. Such correlation coefficients provide information by themselves (Miller *et al.* 1958) and would be helpful to the plant breeder since they are based on transmissible genetic variance.

Materials and Methods

Sixteen long duration pigeonpea hybrids were developed involving genetic male sterile (ICPMS 3983) seed parent. The hybrids were grown in a Randomized Block Design with three replications in two crop seasons i.e., July (*Kharif*) and September (*pre-rabi*). *Kharif* experiment was planted in the first week of July and *pre-rabi* in the first week of September. Each plot consisted of four rows of 4 m. length. The row to row distance was 60 cm and 30 cm and plant to plant 20cm and 10 cm, respectively in *Kharif* and *pre-rabi*. The data were recorded on ten randomly selected plants in each entry and replications. Phenotypic and genotypic correlation coefficients among important characters like seed yield plot⁻¹, days to initial flowering and maturity,

plant height at initial flowering and at maturity, number of primary and secondary branches, pods and seed yield plant⁻¹, number of seeds pod⁻¹, 100-seed mass and harvest index were estimated as per procedure by Searle (1961). The significance of correlation coefficients were tested against 'r' value from 'r' table of Fisher and Yates (1938) for (n-2) degree of freedom, where, 'n' is the pair of characters.

Results and Discussion

(I) *Kharif*

Among the long duration hybrids seed yield plot⁻¹ was found to be significantly correlated with number of pods and seed yield plant⁻¹ at genotypic level, whereas none of the characters showed significant association with seed yield plot⁻¹ at phenotypic level. Harvest index has shown significant positive association with number of seeds pod⁻¹ at genotypic level while at phenotypic level significant negative association was found between harvest index and plant height at maturity stage (Table-1).

The significant positive associations were found between the characters like days to initial flowering with seed pod⁻¹; height of the plant at initial flowering with plant height at maturity, primary and secondary branches, pods and seed yield plant⁻¹; days to maturity with seeds pod⁻¹; plant height at maturity with primary branches and pods plant⁻¹; primary branches plant⁻¹ with secondary branches, pods and seed yield plant⁻¹; secondary branches plant⁻¹ with seeds pod⁻¹ and seed yield plant⁻¹ with yield plot⁻¹; seeds pod⁻¹ with 100-seed mass at genotypic level whereas at phenotypic level, only plant height at initial flowering with height of the plant at maturity. Negative and significant associations were also observed among some of the characters such as seeds pod⁻¹ with plant height at initial flowering, maturity, pods and

Table 1. Genotypic and phenotypic correlations among characters in late maturing pigeonpea hybrids (Kharif).

Branches		Plant height at flowering	Days to maturity	Plant height at maturity	Primary branches plant ⁻¹	Secondary Pods	Pods	Seeds pod ⁻¹	Harvest index	100-seed mass	Seed yield plant ⁻¹	Seed yield plot ⁻¹
Days to initial Flowering	G	-0.235	0.250	-0.314	-0.221	0.569	-0.066	1.377**	-0.046	-0.260	0.100	-0.148
	P	-0.190	0.159	-0.260	-0.127	0.236	-0.001	0.244	0.011	0.206	0.093	-0.124
Plant height at initial flowering	G		-0.132	1.000**	0.926**	0.594	1.066**	-1.68**	-0.443	-0.70**	0.781**	0.426
	P		-0.144	0.925**	0.277	0.376	0.538	-0.198	-0.232	-0.478	0.415	0.444
Days to maturity	G			-0.060	-0.483	-0.097	-0.393	0.878**	-0.131	0.569	0.575	-0.488
	P			-0.112	-0.217	0.005	-0.133	0.049	-0.194	-0.366	-0.331	-0.239
Primary branches plant ⁻¹	G				0.848**	0.495	0.917**	-0.78**	-0.642*	-0.696*	0.564	0.239
	P				0.564	0.329	0.504	-0.278	-0.350	-0.519	0.348	0.334
Secondary branches plant ⁻¹	G					0.760**	1.055**	-0.469	-0.379	-0.683*	1.084**	0.369
	P					0.461	0.547	-0.133	-0.390	-0.342	0.413	0.258
Pods plant ⁻¹	G						0.565	0.747**	-0.316	-0.390	0.594*	0.419
	P						0.517	-0.111	-0.132	-0.228	0.444	0.237
Seeds Pod ⁻¹	G							-1.10**	-0.158	-0.693*	0.998**	0.828**
	P							0.059	-0.022	-0.447	0.582	0.477
Harvest index	G								1.042**	1.074**	-0.82**	-0.445
	P								0.053	0.183	-0.007	0.164
100-seed mass	G									-0.365	-0.247	0.952**
	P									-0.110	-0.144	0.490
Seed yield plant ⁻¹	G										0.332	-0.224
	P										0.175	0.228

* Significant at P=0.05, ** Significant at P=0.01

Table 2. Genotypic and phenotypic correlations among characters in late maturing Pre-rabi pigeonpea hybrids

Branches	Plant height at flowering	Days to maturity	Plant height at maturity	Primary branches plant ⁻¹	Secondary Pods	Seeds pod ⁻¹	Harvest index	100-seed mass	Seed yield plant ⁻¹	Seed yield plot ⁻¹
Days to initial flowering	G 0.003 P 0.057	0.729* 0.433	0.128 0.069	-0.612* -0.367	-0.492 -0.186	-0.389 -0.197	-0.104 -0.123	0.614* 0.383	-0.443 -0.462	-0.479 -0.381
Plant height at initial flowering	G P	0.213 0.152	1.000** 0.946**	0.731** 0.544	0.277 0.194	-0.529 -0.375	-0.805** -0.584	-0.267 -0.230	-0.485 -0.262	-0.270 -0.222
Days to maturity	G P		0.278 0.238	0.020 0.012	0.284 0.216	-0.566 -0.405	-0.218 -0.185	0.412 0.337	-0.450 -0.344	-0.332 -0.270
Primary branches plant ⁻¹	G P			0.670* 0.335	0.229 0.179	-0.681* -0.474	-0.826** -0.644	-0.137 -0.140	-0.550 -0.343	-0.318 -0.260
Secondary branches plant ⁻¹	G P			-0.422 -0.066	0.599** 0.445	-0.369 -0.204	-0.354 -0.185	-0.761** 0.476	-0.043 0.130	-0.053 -0.006
Pods plant ⁻¹	G P				0.327 0.132	0.876** 0.332	0.519 0.242	0.043 0.023	0.705* 0.455	0.217 0.166
Seeds Pod ⁻¹	G P					0.072 0.023	0.241 0.238	-0.408 -0.286	0.598 0.422	0.414 0.278
Harvest index	G P						0.661* 0.515	-0.282 -0.174	0.765** 0.439	0.344 0.165
100-seed mass	G P							-0.424 -0.347	-0.140 -0.105	0.675* 0.597*
Seed yield plant ⁻¹	G P								-0.174 -0.149	0.860** 0.769**

* Significant at P=0.05, ** Significant at P=0.01

Table 3. Correlations among seasons (Kharif vs. Pre-rabi) for different characters in late maturing pigeonpea hybrids.

Branches	Plant height at flowering	Days to maturity	Plant height at maturity	Primary branches plant ⁻¹	Secondary Pods	Seeds pod ⁻¹	Harvest index	100-seed mass	Seed yield plant ⁻¹	Seed yield plot ⁻¹
Kharif Vs Pre Rabi	0.280	0.674*	0.186	0.689*	0.385	-0.072	0.831**	0.275	0.158	0.188

* Significant at P=0.05, ** Significant at P=0.01

seed yield plant⁻¹ and 100-seed mass with plant height at flowering, maturity, primary branches and pods plant⁻¹ at genotypic level.

(II) Pre-rabi

In pre-rabi season, seed yield plot⁻¹ was found to be highly correlated with seed yield plant⁻¹ and harvest index at both genotypic and phenotypic levels. Significant and positive association was found between seed yield plant⁻¹ and primary branches and pods plant⁻¹ and seeds pod⁻¹ at genotypic level (Table-2). Harvest index showed significantly positive association with seeds pod⁻¹. Significant negative association was observed between plant height at initial flowering and at maturity stage at genotypic level and harvest index and plant height at maturity stage at phenotypic level.

The significant positive associations were found among the characters like, days to initial flowering with days to maturity and 100-seed mass; height of the plant at initial flowering with plant height at maturity and primary branches plant⁻¹; plant height at maturity with primary branches plant⁻¹; primary branches plant⁻¹ with pods plant⁻¹; secondary branches plant⁻¹ with seed pod⁻¹ and seed yield plant⁻¹; seeds pod⁻¹ with seed yield plant⁻¹; at genotypic level while plant height at initial flowering with plant height at maturity have shown significant positive association at phenotypic level.

The association between crop seasons (*Kharif* Vs. *Pre-rabi*) also estimated and found that the height of the plant at initial flowering, plant height at maturity and harvest index exhibited the significantly positive correlation between sowing seasons (Table-3).

Genotypic correlations were found to be always higher than the phenotypic correlations in the same direction which suggested a fairly strong inherent association between the characters studied. Expression of the phenotypic correlation was reduced most likely under the influence of environment and crop season. The above mentioned results indicated that the number of primary and secondary branches and pods plant⁻¹ and seeds pod⁻¹ were the major yield attributing characters. A suitable combination of the primary and secondary branches and pods plant⁻¹ and seeds pod⁻¹ should be considered while selecting for high yielding genotypes. The best index of higher yield of a genotype among the traits studied was the number of pods plant⁻¹. Number of primary branches plant⁻¹ is a highly heritable

trait. Govina Raju and Sharat Chandra (1972) and Beohar and Nigam (1972) made that the primary branches has a highly positive correlation with yield and other yield components such as number of secondary branches plant⁻¹. Garten (1990) reported that number of branches (primary and secondary), number of pods plant⁻¹, number of seeds plant⁻¹ are apparently the main yield contributing characters in pigeonpea.

It may be concluded that the number of primary and secondary branches and pods plant⁻¹ are the prime contributing characters to seed yield, although plant height contributes significantly by increasing all these traits, which were themselves positively correlated in this investigation.

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