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CORRELATIONS AND PATH ANALYSIS OF YIELD AND ITS COMPONENTS IN PIGEONPEA

Bashir Ahmed Malik, M. Riaz Malik and Imtiaz Ahmed Khan

National Agricultural Research Centre, PARC, Islamabad

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High genotypic and phenotypic coefficients of variation were observed for pods per plant and yield per plant. Genotypic correlation of yield per plant with pods per plant was high and positive. Association between seeds per pod and pod length was very high and positive. Direct effect of pods per plant on grain yield was low and negative.

Key words: Pigeonpea; Genotypic correlation; Phenotypic correlation; Environmental correlation; Path coefficients.

INTRODUCTION

Pigeonpea (*Cajanus cajan* (L) Millsp.) is one of the important food legumes grown in almost all tropical countries. Though considerable variability exists in this important pulse crop, the details are not readily available with the breeders [1]. The present investigations were undertaken to find out the nature and magnitude of genetic variability for yield components and to identify suitable characters for effective selection.

MATERIALS AND METHODS

Ten genotypes of the pigeonpea, obtained from international sources, were grown in a randomized complete block design with 4 replications, at the National Agricultural Research Centre, Islamabad, during 1985. Each plot had 6 rows, 4 m long. The spacing was 60 cm between rows and 10 cm within rows. Observations were recorded on 10 randomly selected plants in each plot on 50 % days to flower pod length, pods per plant, seeds per pod and yield per plant

Genetic parameters, correlation coefficients, and path coefficients were computed using the formulae suggested by Dewey and Lu [2] on IBM personal computer XT.

RESULTS AND DISCUSSIONS

Mean and genetic parameters for some quantitative characters in pigeonpea are given in Table 1. High values for genotypic and phenotypic coefficients of variation were observed for pods per plant and yield per plant. Low values were observed for seeds per pod and days to flower. Luthra and Singh [3] reported high values of genotypic and phenotypic coefficients variation for pods per plant, clusters per plant and yield per plant. Heritability (broad sense) was found to be highest for yield per plant (85 %), followed by days to flower (74 %), pod length (46 %), seeds per pod

Table 1. Genetic parameters for some quantitative characters in Pigeonpea

Character	Range	Variance		Coefficient of variability		Herit-	G.A.*	G.A as % of
		Genotypic	Phenotypic	Genotypic	Phenotypic	ability. %		mean
Days to flower	67.5-78.5	15.44	20.97	5.42	6.32	74	8.88	12.26
Pod length	3.98-5.0	0.09	0.19	6.76	9 76	48	0.56	12 23
Pods per plant	85.3-157.0	257.7	1102.6	12.89	26.67	23	20.16	16.18
Seeds per pod	3.68-4.38	0.02	0.02	3.76	7.62	24	0 19	4 60
Yield per plant	16.25-30.5	20.22	23.83	17.35	18.83	85	10 95	42.23

*Genetic advance using 5 % selection intensity.

Table 2. Genotypic (rg), phenotypic (rph) and environmental (re) correlation coefficients

Character	Coefficient	Pod length	Pods per plant	seeds per pod	Yield per plant
Days to flower	rg	−0.59**	0.21	−0.34	0.54*
	rph	−0.32	0.11	−0.19	0.42
	re	0.10	−0.01	−0.10	−0.05
Pod length	rg		−0.34	0.95**	−0.34
	rph		−0.14	0.57*	−0.23
	re		−0.01	0.40	−0.05
Pods per plant	rg			−0.62**	0.86**
	rph			−0.15	0.41
	re			0.003	−0.11
Seeds per pod	rg				−0.17
	rph				−0.16
	re				−0.03

* = p < 0 05; ** = p < 0 01.

Table 3. Direct (Bold) and indirect effects of different characters with yield.

Character	Days to flower	Pod length	Pods per plant	Seeds per pod	Genotypic correlation with yield
Days to Flower	1.89	−2.60	−0.07	1.33	0.54
Pod length	−1.12	4.40	0.12	−3.74	−0.34
Pods per plant	0.40	−1.48	−0.36	2.30	0.86
Seeds per pod	−0.64	4.18	0.22	−3.94	−0.17

(24 %), and pods per plant (23 %). Luthra and Singh [3] also reported highest broad sense heritability for yield per plant.

The expected genetic advance, expressed as percentage of the mean, was highest for yield per plant (42.24 %). This high estimate was coupled with high heritability, which is an indication of the additive gene effect. On the basis of additive effect it is likely that the selection based on phenotypic values may be useful in improving the yield. For days to flower, high heritability was associated with low genetic advance, which is an indication of dominant and epistasic nature of inheritance.

Genotypic (rg), phenotypic (rph) and environmental (re) correlation coefficients are presented in Table 2. Genotypic correlation coefficients were found to be higher than corresponding phenotypic and environmental correlations, which is an indication of inherent relationship between the characters studied. Rani and Rao [4] also reported similar results.

Genotypic correlation of yield per plant with days to flower and pods per plant was positive and high (rg =0.54 and 0.86 respectively). Tikka and Sawa [5] also reported a positive association between yield per plant with days to flower and pods per plant. Luthra and Singh [3] and Katiyar [6] observed a strong positive correlation between yield per plant and pods per plant Association between seeds per pod and pod length was fairly high and positive (rg =0.95), while the association of seeds per pod with pods per plant was negative and high (−0.63). Pods length was negatively correlated with days to flower. Luthra and Singh [3] also reported negative correlations of pod length with the days to flower.

The results of partitioning of correlation by the path coefficient technique with grain yield as the resultant variable and other characters as causal variables are presented diagrammatically in Fig. 1. Estimates of the direct and indirect effects are presented in Table 3.

The direct effect of days to flower on grain yield was high and positive (1.90). The indirects effects *via* seeds per pod was also positive, while the indirect effects *via* pod length and pods per plant were negative.

The high positive direct effect of pod length was nullified by high negative indirect effect through days to flower and seeds per pod, yielding a total correlation of −0.40.

There was a direct low negative influence of pods per plant on grain yield (−0.36) but the positive indirect effects *via* seeds per pod (2.30) and days to flower (0.40), yielding a high positive correlation (rg =0.86). Toyagi *et al.* [7] reported high negative direct effect of pods per plant.

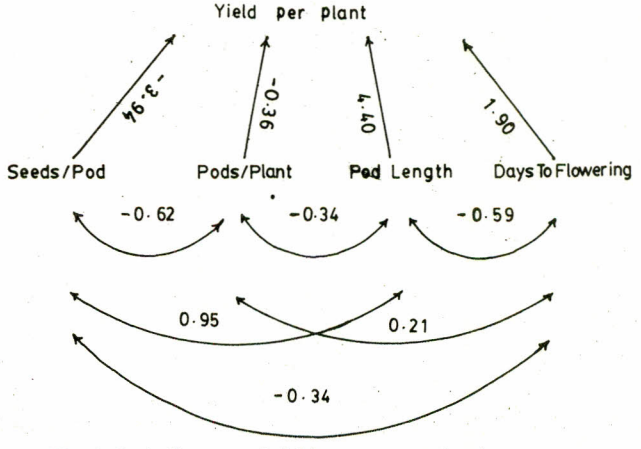

Fig. 1. Path diagram of yield components in pigeonpea.

Very high negative direct effects of seeds per pod on grain yield (–3.94) was counterbalanced by positive indirect effects *via* pod length and pods per plant (4.18 and 0.22 respectively). This counterbalancing resulted in low negative total correlation with yield (rg =–0.17). Malik *et. al.* [8] also reported fairly high negative direct effect of seeds per pod.

An overall analysis of path coefficients in the present study suggested that in pigeonpea, pod length and days to flower should be given the maximum weightage for grain yield improvement.

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