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Selection Criteria in Pigeonpea (*Cajanus cajan* (L.) Millsp.) using Correlation Coefficient and Path Analysis

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ABSTRACT

Correlation coefficient and path analysis were studied for seed yield and yield attributing traits in pigeonpea [Cajanus cajan (L.) Millsp.]. The present investigation was conducted during the kharif season 2014 and 2015. Twelve promising genotypes along with two checks i.e. Manak and Paras were evaluated for yield and yield attributing traits. There was significant variation observed for all the characters under study. Seed yield per plant was found to be significantly positively associated with number of pods per plant at both genotypic and phenotypic level, days to 50% flowering, days to maturity and 100 seed weight at genotypic level only. Path coefficient analysis (genotypic and phenotypic) showed that number of primary branches exhibited the highest genotypic magnitude on seed yield/plant, followed by days to 50% flowering and plant height.

Key words: *Pigeonpea, correlation coefficient, yield and path coefficient*.

INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is the second most important pulse crop of our country. It is also known as red gram, arhar and tur. It is a rich source of protein and is grown in a wide range of environment. Pigeonpea seeds have 19-25% protein and are consumed as green peas, whole grain or split peas[1]. It is hardy, widely adapted and drought tolerant crop. Being yield a complex trait and many characters contribute towards it, keeping these facts in mind the information on the correlation between yield & yield attributing traits and their direct and indirect effects is an important tool for plant breeder for further crop improvement. Thus, the present investigation was conducted to assess the magnitude of phenotypic and genotypic coefficient of variation, phenotypic and genotypic variability. So that information on these aspects can be further use in the development of superior genotypes under rainfed conditions.

MATERIALS AND METHODS

The experiment was conducted during *Kharif*, 2014 and 2015 at experimental area of Pulses Section, Department of Genetics and Plant Breeding, College of Agriculture, CCS HAU, Hisar.

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A total of 14 promising genotypes of pigeonpea including two checks were grown in randomized block design with three replications. Row to row and plant to plant spacing were kept 45 cm and 15 cm respectively. Observations were recorded for characters namely days to 50% flowering, days to maturity, plant height (cm), number of primary branches, number of pods per plant, 100 seed weight (g) and grain yield per plant (g) on five randomly selected plants. The data was statistically analyzed and mean values were subjected for analysis. Phenotypic and genotypic correlation coefficients of yield and yield contributing traits were worked out as per the method suggested by Panse and Sukhatme[5]. The Path coefficient analysis was done for yield and yield contributing traits to estimate the direct and indirect effects of various characters on seed yield[3].

RESULTS AND DISCUSSION

The analysis of variance shows highly significant differences for all the traits under study. The estimates of phenotypic and genotypic coefficient are presented in Table 1. At the genotypic and phenotypic level number of pods per plant showed significant positive correlation with seed yield. The results were supported by the earlier findings of Mahajan *et al*[4]., for number of pods per plant. This shows the importance of number of pods per plant towards yield. Hence, this is the most reliable component of yield and can be very well used as an indicator of grain yield[2]. Days to flowering, days to maturity and 100 seed weight showed significant positive correlation with seed yield at genotypic level but no such correlation was observed at phenotypic level. Plant height and number of branches showed significant negative correlation with seed yield at genotypic level. Significant and positive correlation was observed between days to flowering and days to maturity, days to flowering with number of pods and 100 seed weight, between days to maturity and plant height, days to maturity and number of branches and days to maturity and number of pods. Positive correlation was observed between plant height and number of branches but negative significant correlation with number of pods. Number of pods and number of branches showed significant negative correlation. At the phenotypic level number of pods and 100 seed weight were significant positively correlated but between these two traits negative significant correlation was observed at genotypic level.

Seed yield is considered to be a complex character as it is influenced by many plant characters and it also exhibits low heritability. Various traits shows interactive effect on seed yield of a plant. As ancillary characters shows less effect of environmental fluctuations than the seed yield, therefore, further selection can be done more effectively on the basis of these characters. The path coefficient was carried to study direct and indirect effect of various trait components for a reliable selection of genotypes. In the present investigation all the characters showed high values of direct effect on seed yield/plant. However, number of primary branches exhibited the highest genotypic magnitude (0.879) on seed yield/plant, followed by days to 50% flowering (0.756) and plant height (0.746). These characters are few of major yield contributing characters. Correlation of character showed that number of primary branches and plant height had negative

correlation (-0.500 & -0.439 respectively) with seed yield/plant. However, Days to 50% flowering showed strong positive correlation (0.877) with seed yield/plant.

In addition to direct genotypic and phenotypic direct positive effect (0.879 & 0.530 respectively) of number of primary branches on seed yield, the character also showed indirect genotypic & phenotypic positive effect through number of pods (0.811 & 0.042 respectively) and 100 seed weight (0.354 & 0.003 respectively). The studies are in confirmation with studies by Singh *et al*[7].

Days to 50% flowering showed its indirect correlation with seed yield through other characters also. It showed indirect positive correlation of days to maturity (0.170), whereas, indirect negative correlation of plant height (-0.003), number of primary branches (-0.756), number of pods (-0.233) and 100 seed weight (-0.865) with seed yield/plant. Phenotypic coefficient showed that days to 50% flowering had direct positive effect (0.117) on seed yield. The trait showed its indirect effect on yield through all the characters and showed positive magnitude except days to maturity (-0.094).

Table 2 exhibited that number of pods per plant showed direct negative effect (-0.635) on seed yield. Singh *et al*[7]., also exhibited negative direct effect of this character. The character also showed indirect influence on seed yield through strong positive effect of days to 50% flowering (0.923), days to maturity (0.527), plant height (0.601) and 100 seed weight (0.735), whereas, number of branches (-0.832) showed indirect negative effect on yield of plant. Number of pods also exhibited high positive correlation (0.823) with yield per plant.

Unlike of genotypic the phenotypic direct effect of pods per plant on seed yield showed positive value (0.228). This character also showed indirect contribution on seed yield showing positive effect through days to 50% flowering (0.018), plant height (0.040) and number of primary branches (0.098). Whereas, days to maturity and 100 seed weight showed a week negative effect (-0.043 & -0.031 respectively). Results observed are similar to findings by Sarsamkar *et al*[6]., which also showed direct positive effect of pods per plant. The character number of pods per plant also showed good positive correlation (0.309) with seed yield per plant.

It is evident also from previous studies by researchers that seed yield of plant is a complex characters as it is influenced by various yield attributing characters at genotypic and phenotypic level. From present study we can conclude that the yield of any plant is result of interaction of genotypic and phenotypic characters. It can be concluded from the present study that days to flowering, days to maturity, number of branches, number of pods and 100 seed weight were the major yield components.

Similarly, some of the characters of pigeonpea are directly involved in yield contribution such as days to 50% flowering, number of primary branches and number of pods. However, other characters also involved in their contribution to seed yield of plant. Undoubtedly if plant genotype is strong but unfavorable environmental factors prevails, would results into significant seed yield losses. Therefore, if major yield attributing characters such as early days for 50% flowering, plant height and number pods per plant can be managed and maintained through breeding methods, the plant yield can be enhanced for a particular Pigeonpea variety.

Table 1: Genotypic and phenotypic correlation coefficients of morphological and yield parameters

Character		Days to 50% flowering	Days to maturity	Plant height (cm)	Number of primary branches	Number of pods/plant	100 seed weight (g)	Seed yield/plant (g)
Days to 50% flowering	**G**	1.000	0.231	0.001	-0.402**	1.942**	0.514**	0.877**
	P	1.000	0.568**	-0.01	0.045	0.153	0.169	0.072
Days to maturity	**G**		1.000	0.368*	0.384*	0.719**	-0.288	0.931**
	P		1.000	0.022	0.211	0.262	0.015	0.064
Plant height (cm)	**G**			1.000	1.172**	-1.228**	-0.031	-0.439**
	P			1.000	0.560**	-0.112	0.02	-0.09
Number of primary branches	**G**				1.000	-4.430**	-0.21	-0.500**
	P				1.000	0.185	-0.04	0.347*
Number of pods /plant	**G**					1.000	-1.380**	0.823**
	P					1.000	0.398**	0.309*
100 seed weight (g)	**G**						1.000	0.531**
	P						1.000	0.001
Seed yield/plant (g)	**G**							1.000
	P							1.000

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

G, P = genotypic and phenotypic correlation coefficients respectively

Table 2: Path coefficient (genotypic and phenotypic) analysis showing direct and indirect effects of eight casual variable on seed yield/plant

Characters		Days to 50% flowering	Days to maturity	Plant height (cm)	Number of primary branches	Number of pods	100 Seed weight (g)	Seed yield/plant (g)
Days to 50% flowering	**G**	**0.756**	0.170	-0.003	-0.756	-0.233	-0.865	0.877**
	P	**0.117**	-0.094	0.003	0.024	0.035	-0.013	0.072NS
Days to maturity	**G**	0.825	**0.733**	-0.377	0.722	-0.456	0.484	0.931**
	P	0.067	**-0.165**	-0.008	0.112	0.060	-0.001	0.064NS
Plant height (cm)	**G**	0.003	0.269	**-0.746**	0.520	0.780	0.052	-0.439**
	P	-0.001	-0.004	**-0.355**	0.297	-0.025	-0.002	-0.090NS
Number of primary branches	**G**	-0.434	0.282	-0.392	**0.879**	0.811	0.354	-0.500**
	P	0.005	-0.035	-0.199	**0.530**	0.042	0.003	0.347*
Number of pods	**G**	0.923	0.527	0.601	-0.832	**-0.635**	0.735	0.823**
	P	0.018	-0.043	0.040	0.098	**0.228**	-0.031	0.309*
100 Seed weight (g)	**G**	0.831	-0.211	0.115	-0.395	0.876	**-0.685**	0.531**
	P	0.020	-0.003	-0.007	-0.021	0.091	**-0.079**	0.001NS

Figure in bold indicate the direct effect, Residual effect = 0.818 (genotypic) and 0.716 (phenotypic)

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