INTRA-GROUP CORRELATIONS IN THREE MATURITY GROUPS OF PIGEON PEA

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Correlations between agronomic traits (growth attributes and yield components) and yield would also depend on the material chosen for study. Badwal and Singh (1973) and Kedarnath *et al.* (1961) found varying associations in three morphological groups of groundnut and linseed respectively. Utilization of early, medium and late maturing genotypes is becoming increasingly important in pigeon pea (*Cajanus cajan* (L) Millsp) breeding programmes and response to selection among crosses involving cultivars for different maturity groups would also depend on character association, particularly in different maturity groups. Pigeon pea has genotypes ranging in maturity from around 130 days to 240 days which are adapted to different farming systems, but the information in interrelationships between characters among different maturity groups is not available in the literature. Therefore, in this study, the nature of association between yield and its components is examined in three maturity groups involving 272 genotypes.

Materials and Methods

Two hundred seventy two pigeon pea genotypes, comprising of 34 early (upto 150 days), 91 medium (upto 200 days) and 146 late (upto 240 days) ones were chosen for the study from the genetic stock collection. These lines were grown in 1974 at experimental farm of JNKVV Jabalpur with 1 m distance between rows and 30 cm plant to plant. Mean of 5 plants for 9 characters viz. plant height (cm), width (cm), pod bearing length (cm), number of primary and secondary branches, number of pods/plant, number of seeds/pod, 100 seed weight and seed yield/plant was determined at appropriate time Correlation coefficients (r) were computed for each pair of character within three maturity groups separately. χ^2 test was made to determine the goodness of fit between corresponding 4 values of three maturity groups for each characters pair according to the method of Ausemus as given by Hayes, Immer and Smith (1955). Where the three values did not differ their combined value of 'r' was considered.

Results and Discussion

The estimates of correlations between yield and 8 agronomic traits within three maturity groups are given in Table 1. Wherever the r values for three groups were not found to differ by χ^2 test, only a combined value has been given. Out of 36 character pair comparisons, 13 had different associations in three maturity groups and for remaining character pairs (23) only one r value is good enough to indicate the nature of association irrespective of maturity groups.

Seed yield was positively associated with 100-seed weight, number of primary branches and pod bearing length in all the groups whereas in medium

TABLE 1

Correlation Coefficients (r) of seed yield and some agronomic characters in 3 maturity groups of pigeon pea

Characters	Plant width	Pod bearing length	Primary branch number	Secondary branch number	Pods per plant	Seeds per pod	100 seed weight	Seed yield/ plant
Plant height	0·264[1] 0·040[2] −0·556**[3]	0·422**	0·551**	0·207**	−0·030	0·090	−0·002	−0·005
Plant width		0·060	0·184 −0·047 −0·366**	0·119	0·363**	−0·143 −0·111 −0·781**	0·105 0·128 −0·565**	0·012 0·210* 0·518**
Pod bearing length			0·336**	0·129*	0·139*	−0·048 0·046 0·730**	−0·036 0·062 0·561**	0·371**
Primary branch number				−0·023 0·317** 0·662**	0·207**	0·168**	−0·652** 0·027 0·015	0·168**
Secondary branch number					0·345**	−0·010	−0·010	−0·110
Pods per plant						0·349* −0·346** 0·008	−0·136 −0·646** −0·178*	0·252 0·588** 0·732**
Seeds per pod							0·070	−0·196 0·125 0·641**
100 seed weight								0·226**

1 early 2 medium 3 late group.

and late groups plant width and number of pods per plant also had positive association with yield. Number of seeds per pod had positive relationship with yield in late group only. It would thus appear that if yield improvements in early group is the objective then perhaps more emphasis on seed index and pod bearing length would be desirable. Since vegetative period is shorter in early types, more plant width and more number of pod beyond certain threshold may not be attainable readily but selection for these attributes would contribute more to yield increases in medium and late types.

Plant height was positively associated with most of the vegetative growth attributes such as pod bearing length and number of primary or secondary branches in all the maturity groups but it was negatively associated with plant width in the late group. It did not have any association with any of the yield components. The relationship indicates that height primarily is a reflection of more vegetative growth which is not necessarily indication of higher yield or yield components. In other words shorter types would also be equally or more productive. Negative association of height with width (normally both are expression of vigorous vegetative growth) in late types tend to indicate the agro-ecological adapations of these types to mixed cropping with sorghums. Tall and compact types tended to have adapted and have been selected for over a long period of time in such mixed cropping situations. This type of linkages were not cared for or preserved in medium and early types. If only limited number of genotypes are studied one may find positive association of plant height or width (being attributes of vegetative growth) as reported by Sharma, Singh, Sharma and Parashar (1971). But clearer picture emerged through the study of intra-maturity group correlations. Plant width, another index of vegetative growth, had positive association with pod number in all maturity groups but had negative association with primary branch number, seeds per pod, and 100 seed weight in late group. It might have contributed to yield in medium and late groups through increases in pod number only because in late group excessive width (due to negative correlation) would result in reduced seed number per pod and seed size. Such possibility of excessive vegetative growth does not exist in early types hence width does not seem to affect yield potential, and if at all, it would do so positively through more primary branches.

Pod bearing length had positive association with primary and secondary branch number and pod number in all maturity groups. In late group, however, it was positively associated with seeds per pod and 100 seed weight also. It would therefore, be desirable to lay more emphasis on pod bearing length in late group along with judicious width for further yield improvements and desirable seed size.

Primary branch number is positively associated with pod number and seeds per pod in all the maturity groups. Similarly secondary branches also had positive association with pod number in all the maturity groups. There were thus no intragroup variation of associations with branch number.

Pod number was positively associated with seed per pod in early group, negatively associated in medium group and had no association in late group.

TABLE 2

Mean and range of characters in three maturity groups of pigeon pea

Character	Early		Medium		Late	
	Mean	Range	Mean	Range	Mean	Range
Plant height (cm)	129·7	104·0–155·6	142·0	111·2–181·9	158·5	80·0–235·6
Plant width (cm)	58·6	39·3– 80·3	61·2	36·3– 98·3	57·7	17·0–106·6
Pod bearing length (cm)	57·4	33·6– 71·6	48·4	29·4– 83·6	59·9	10·0– 76·8
Primary branch number	7·1	3·2– 11·4	10·0	4·8– 22·8	13·2	6·6– 23·0
Secondary branch number	8·8	1·6– 31·8	9·2	2·0– 23·0	11·6	1·2– 44·6
Pod number	183·8	92·0–349·2	208·0	95·2–423·6	210·6	74·4–479·8
Number of seeds/pod	3·2	2·6– 3·8	3·3	2·6– 4·0	3·3	1·9– 4·1
100 seed weight (g)	8·2	3·6– 12·9	7·9	5·3– 10·8	7·7	3·7– 11·0
Seed yield/plant (g)	22·4	8·9– 56·0	33·7	10·9– 96·9	30·1	10·3– 86·6

This variable pattern obviously can not be explained on physiological thresholds. Lack of variability for seeds per pod perhaps have also resulted in these association patterns. Pod number, however, had negative association with 100 seed weight in all groups though not significantly in early group. 100 seed weight was positively associated with seed yield in all maturity groups.

Growth characters such as height, width, branching and pod bearing length not only determine plant types as adapted to different farming systems but also determine the infloresence type and yield contributing attributes. In turn, these growth characters are largely determined by duration of vegetative and reproductive phases which are very widely different in three maturity groups. The analysis and appreciation of the varying associations of these growth attributes with yield and its components would considerably help the breeder, whether he is aiming the improvement within the group or between the groups. The present study comprised of stocks showing wide variability for most of growth & yield attributes (Table 2) and has clearly brought out some variable associations of importance in different maturity groups. For instance in early group the yield increases should be emphasised through pod bearing length, pods per plant and seed size. Primary branch number would contribute to yield increase but has to be judiciously selected for with optimum seed size. In medium and late groups however, plant width and seeds per pod would also be helpful in yield increases, but in late group seeds per pod and 100 seed weight would have been judiciously combined to circumvent their negative association.

In summary, it should be possitle to visualise high yielding early types by incorporating bold seed size and long pod bearing length with few primary branches. Whereas in late type emphasis on branching and seed number per pod would be desirable in addition to the ones listed in early group.

In medium types a judicious selection index involving all of above attributes could lead to gains in yield.

Summary

Character associations involving growth attributes such as plant height, width, pod bearing length and branch number and yield components such as pod number per plant, seeds per pod, and 100 seed weight were determined amongst themselves and with yield among three maturity groups of pigeon pea separately and jointly (where r values were homogenous). Out of 36 character association comparisons 13 associations were different in three maturity groups. On the basis of these intra group correlations it was suggested that high yielding early types could result by incorporating bolder seed size and longer pod bearing length with few primary branches. In late types emphasis on more branching and seed number per pod would be desirable in addition to pod bearing length & seed size.

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