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CHARACTER ASSOCIATION AND PATH ANALYSIS IN VEGETABLE COWPEA

A.CHATTOPADHYAY, T.DASGUPTA, P.HAZRA and M.G.SOM

Department of Horticulture
Bidhanchandra Krishi Viswavidyalaya
Mohanpur,
Nadia 741 252

ABSTRACT

The genotypic and phenotypic correlations of green pod yield with different components were estimated from 20 genotypes of vegetable cowpea pooled over two seasons. The genotypic and phenotypic correlations agreed closely with each other. Pod length, green pod weight, dry pod weight, seeds per pod and 100 seed weight exhibited significantly positive correlations with green pod yield. Their genotypic correlations with green pod yield were also high and positive. Days to flowering, on the otherhand, registered high and negative association with green pod yield both at phenotypic and genotypic levles. A few significantly positive interrelationship were found between the different components. Pod number, on the contrary, exhibited significantly negative interrelationships with green pod weight and pod length. The path coefficient analysis of green pod yield showed that green pod weight, dry pod weight, pod number and seeds per pod were the most important components because of highly positive direct effects. Days to flowering registered highly negative direct effect indicating early flowering would lead to high yield. Therefore, green pod weight, dry pod weight, pod number, seeds per pod and days to flowering were the important components for improving pod yield in vegetable cowpea.

KEY WORDS : Cowpea, correlation, path analysis

Yield is a complex character which is influenced by a number of component traits. The knowledge of correlation helps in determining the relative importance of component characters influencing yield whereas the path coefficient analysis provides an effective means of partitioning direct or indirect causes of association. Correlation and path analysis thus help in identifying suitable selection criteria for improving the yield. In view the meagre information available on component analysis of vegetable cowpea, the present investigation was undertaken to assess the importance of various components of green pod yield in vegetable cowpea.

MATERIALS AND METHODS

Twenty promising genotypes belonging to two cultigroups *viz., unguiculata* and *sesquipedalis* from exotic and indigenous sources were selected

r the present investigation. Randomised block esign with three replications was used. The aterials were grown during pre-*kharif* and *kharif* easons in 1993 at District Seed Farm, Kalyani. A ngle row plot of 6m length was alloted to each enotype. The spacing between rows and plants ere kept between 60 cm and 30 cm, respectively. he recommended package of practices were llowed for cultivation.

The mean values of five plants of each enotypes selected at random were used for atistical analysis. The observations were reocrded n 11 morphophysiological characters *viz.*, plant ight, branches per plant, peduncle length, days to owering, pod length, green pod weight, dry pod eight, pod number per plant, seed number per od, 100 seed weight and green pod yield per plant. he correlation coefficient A1-Jibouri *et al.*, 1958) nd path coefficient analysis (Dewey and Lu, 1959) ere analysed.

RESULTS AND DISCUSSION

Correlation coefficients at genotypic and phenotypic levels between paired characters, computed in all possible combinations, are presented in Table 1. In general, the genotypic correlations were greater than the corresponding phenotypic correlations, indicating the preponderance of genetic variance in expression of different characters. However, genotypic and phenotypic correlations agreed closely with each other. Positive and significant association of green pod yield was observed with pod length, green pod weight, dry pod weight, seeds per pod and 100-seed weight. The present observations were in accordance with the findings of Sharma *et al.*,(1988), Tewari and Goutam (1989) and Hazra (1991). However, days to flowering exhibited a significant negative correlation with green pod yield indicating early flowering which would help to minimise the crop duration and ultimately the crop could be adjusted profitably in crop rotations. Non significant positive association with green pod yield was observed for plant height, branches per plant and peduncle length. Interestingly, pods per plant did not exihibit any significant positive association with green pod yield. Thus, differences in genotypes of different cultigroups might be responsible for the complexity of the situation.

Interrelationship between component traits exhibited that pod length was significantly and positively associated with green pod weight, dry pod weight, seeds per pod and 100 seed weight (Table 1). The phenotypic correlations of green pod weight was also found to be significantly positive

Table 1. Phenotypic (P) and genotypic (G), correlation coefficents of various characters in vegetable cowpea

Characters		Branches/ plant	Peduncle length	Days to flowering	Pod length	Green pod weight	Dry pod weight	Pods/plant	Seeds/pod	100-seed weight	Green pod yield/ plant
Plant	P	-0.126	-0.077	0.256	0.389	0.321	0.269	-0.242	0.295	0.277	0.019
height	G	-0.151	-0.129	0.286	0.408	0.332	0.288	-0.252	-0.301	0.249	0.023
Branches/	P		0.371	0.212	-0.299	-0.213	- 0.342	0.172	0.023	-0.046	0.032
Plant	G		0.481	0.242	-0.321	-0.232	-0.354	0.196	0.007	-0.044	0.059
Peduncle	P			0.144	-0.016	0.087	0.116	-0.048	0.062	0.223	0.202
length	G			0.185	-0.022	0.098	0.125	-0.062	0.065	0.246	0.235
Days to	P				-0.301	-0.151	- 0.118	-0.222	-0.106	-0.291	-0.485
flowering	G				-0.319	-0.168	- 0.121	-0.228	-0.125	-0.320	-0.555
Pod length	P					0.903*	0.678*	-0.674	0.678*	0.686*	0.547*
	G					0.914*	0.687	- 0.690	0.705	0.704	0.613
Green pod	P						0.602*	-0.832*	0.537*	0.679*	0.543*
weight	G						0.611	-0.853	0.553	0.696	0.594
Dry pod	P							-0.420	0.558*	0.436	0.543*
weight	G							-0.432	0.584	0.447	0.612
Pods/plant	P								-0.292	-0.375	-0.113
	G								-0.318	-0.391	-0.206
Seeds/pod	P									0.621*	0.551*
	G									0.650	0.606
100-seed	P										0.614*
weight	G										0.705

*The correlation coefficents must exceed 0.433 and 0.549 to be significant at the 5% and 1% levels, respectively.

Table 2. Path coefficient analysis of the components of green pod yield at phenotypic level

Components	Direct and indirect effect via										Correlation with green pod yield/ plant
	Plant height	Branches / plant	Peduncle length	Days to flowering	Pod length	Green pod weight	Dry pod weight	Pods/ plant	Seeds/ pod	100-seed weight	
Plant height	-0.143	-0.022	0.001	-0.035	-0.158	0.451	0.088	-0.214	0.044	0.008	0.019
Branches/plant	0.018	0.178	0.001	-0.029	0.121	-0.300	-0.112	0.152	0.003	-0.002	0.032
Peduncle length	0.011	0.066	0.004	-0.020	0.006	0.122	0.038	-0.043	0.009	0.008	0.202
Days to flowering	-0.037	0.038	0.001	-0.135	0.122	-0.213	-0.039	-0.196	-0.016	-0.010	-0.485
Pod length	-0.056	-0.053	0.001	0.041	-0.405	1.270	0.222	-0.595	0.101	0.023	0.547
Green pod weight	-0.046	-0.038	0.001	0.020	-0.366	1.470	0.197	-0.735	0.080	0.023	0.543
Dry pod weight	-0.038	-0.061	0.001	0.016	-0.275	0.846	0.327	-0.371	0.083	0.015	0.543
Pods/plant	0.035	0.031	0.001	0.030	0.273	-1.171	-0.137	0.883	-0.043	-0.013	-0.113
Seeds/pod	-0.042	0.004	0.001	0.014	-0.274	0.756	0.182	-0.258	0.148	0.021	0.551
100-seed weight	-0.032	-0.008	0.001	0.039	-0.278	0.956	0.142	-0.332	0.092	0.034	0.614

Figures underlined indicate direct effects; Residual effect is 0.2084.

with dry pod weight, seeds per pod and 100 seed weight. The interrelationship of dry pod weight with seeds per pod and seeds per pod with 100 seed weight were highly positive. On the otherhand, pods per palnt showed high negative interrelationship at phenotypic and genotypic levels with pod length and green pod weight indicating more number of pods may lead to short pod length and consequently less green pod weight. From the results, it is evident that pod length, green pod weight, dry pod weight, seeds per pod and 100 seed weight are the main characters through which improvement in pod yield could be obtained.

Selection based only on correlation may be misleading because it measures only the mutual association between two variables, whereas path coefficient analysis specifies and measures the relative importance of different yield components. Hence the phenotypic correlations were partitioned into direct and indirect effects to show the relative importance of yield component towards green pod yield (Table 2). Among the ten yield traits, green pod weight, pod number per plant and dry pod weight showed highly positive direct effects on green pod yield. The positive direct effects of branches per plant, peduncle length, seeds per pod and 100 seed weight were quite low. The indirect effects of green pod weight and dry pod weight were also high and positive through many of the traits. Similarly, the indirect effects of seeds per pod was also positive through majority of the yield attributing traits. So the importance of seeds per pod as yield components can not be overlooked. The maximum direct effects in negative direction was depicted by pod length. The highly positive and significant correlation between pod length and green pod yield was possible due to very high indirect positive effects of green pod weight. Days to flowering also exhibited negative direct effect on green pod yield though the magnitude was quite low suggesting that medium duration variety would probably be more meaningful for higher productivity in vegetable cowpea. The present findings of negative direct effects of pod length and days to flowering on green pod yield find support from Tewari and Goutam (1989). All the characters which showed positive direct effects also showed positive correlation with green pod yield except pods per plant. The highly negative indirect effect of green pod weight was responsible for low and negative correlation of pods per plant with green pod yield.

From the foregoing study, it is evident that improvement in green pod yield in vegetable cowpea could be brought through selection of component characters like green pod weight, dry pod weight, pods per plant, seeds per pod and days to flowering. However, pod weight and pod number can not be improved simultaneously as a negative linkage was found between these two characters. Thus maximum augmentation of pod yield would be derived if plant architecture is redesigned having higher pod weight with more number of seeds per pod and optimum pod number. Such plant must be early maturing to fit well into the intensive cropping pattern.

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VARIABILITY, HERITABILITY AND GENETIC ADVANCE IN SESAME

A. JOHN JOEL AND S. THANGAVELU

School of Genetics
Tamil Nadu Agricultural University
Coimbatore 641 003

ABSTRACT

Ninety five diverse genotypes of sesame were evaluated for variability and heritability estimates in 17 quantitative traits. Close resemblence between GCV and PCV estimates for 100 seed weight, capsule length, capsule breadth, oil content, days to 50 per cent flowering, days to maturity and seed number per capsule, and high heritibility for these traits indicated that selection for these characters would be much effective. The high heritability and genetic advance as per cent of mean for seed yield revealed predominance of additive gene effects.

KEY WORDS : variability, heritability, genetic advance,

In any crop improvement programme, variability present in a population and extent to which it is heritable are important factors to have effective selection. The present investigation was therefore undertaken to assess the variability in sesame and to determine its heritable components.

MATERIALS AND METHODS

Ninety five cultures of sesame, *Sesamum indicum* (L.) comprising 54 introduced and 41 indigenous lines broadly representing the existing variability of diverse geographic origins were chosen from the germplasm maintained at the School of Senetics, Tamil Nadu Agricultural University, Coimbatore. The experiment was carried out on loam soil of pH 7.3 at the oil seed unit of the School of Genetics, Tamil Nadu Agricultural University, Coimbatore. A randomised block design with three replications was adopted. Selfed seeds of each culture was sown in a single row of three m length with a spacing 45 x 15 cm. Observations were recorded on 17 characters on 5 plants selected at random for each genotype in each replication.

The mean values for each character were first analysed by the analysis of variance for which different variance components were computed. The genetic coefficients of variation (Burton, 1952), heritability estimates in broadsense (Lush, 1940) and the expected genetic advance (Johnson *et al.*, 1955).

RESULTS AND DISCUSSION

The analysis of variance for all the traits studied were highly significant. The range, the general mean and the standard error along with the variability estimates such as phenotypic coefficient of variation, genotypic coefficient of variation, heritability, genetic advance and genetic advance as per cent of mean are presented in Table 1. All the characters studied had higher phenotypic coefficient of variation (PCV) than genotypic coefficient of variation (GCV) except 1000-seed weight which showed equal values. Very high GCV estimates were obtained for number of secondaries, seed yield, number of capsules per plant and height to first fruiting branch indicating that these characters are amenable for improvement through selection. Gupta (1975) and Murugesan *et*