It can be concluded that due emphasis should be given during selecting on traits like plant height, pods per plant, seeds per plant and branches per plant for effective improvement in a complex character like grain yield.

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GENETIC VARIABILITY, CORRELATION AND PATH CO-EFFICIENT ANALYSIS IN COWPEA(*Vigna unguiculata* L. Walf)

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ABSTRACT

Genetic Variability, Correlations and path co-efficienis were studied on nine quantitative characters in two F_2 populations of cowpea. A wide range of variation was recorded for most of the characters. Plant height exhibited high heritability coupled with high genetic advance. Grain yield per plant showed significant positive correlation with all the nine characters. Path co-efficient analysis indicated a greater contribution of pod weight and 100 seed weight to seed yield per plant.

KEY WORDS : Cowpea, Variability, Correlations, Coefficients, Path analysis, F_2 population

Cowpea is an important multipurpose legume and fits well in a variety of cropping systems. It is relatively drought tolerant and adopts well to a wide range of soil types. Yield is the most important plant breeding economic factor, which is greatly affected by various factors. *Vigna unguiculata* is a self-pollinated crop, wherein breeders have to put-forth lot of efforts to generate genetic variability for developing improved cultivars. The yield component traits are not independent in their action but are interlinked and in this complex genetic systems selection practised for an individual trait might subseqently bring about a simultaneous change in the other. Thus, an understanding of the association among component traits is essential to succeed in achieving the objectives of a breeding programme. The present investigation was aimed at assessing the genetic variability and association among different characters.

MATERIALS AND METHODS

The material for the study consisted of two F_2 populations of tow crosses viz., v16 x c152 (371) and v16 x S-488 (388). The variety v16 was tolerant to rust disease, while c152 and S-488 were susceptible. Both the F_2 populations were grown following randomised block design with three replications during Kharif season. A row of 5 m length and spacing of 45 cm between the row and 20 cm between the plants was maintained. Recommended cultural practices were followed to raise a good crop. Observations were recorded on plant height, number of branches per plant, number of clusters per plant, number of pods per plant, pod length, number of seeds per plant pod weight,

Table 1. Genetic parameters for the two crosses for nine characters in F_2 population of Cowpea (*Vigna unquiculata*) (L.) Walp.)

Character	F_2 Population	Range	Mean ± SE	P.V.	G.V.	PCV	GCV	h^2 (BS)	G.A.	G.A %
Plant height	V16xC152	26.60	43.340 ± 0.602	54.504	9.133	17.032	6.972	16.756	2.548	5.879
	V16xs488	29.95	51.533 ± 1.325	263.529	213.347	31.500	28.343	80.957	27 052	52.494
No. of branches/pl.	V16xC152	21.60	3.286 ± 0.907	1.431	0.280	36.400	16.098	19.566	0.480	18.607
	V16xs488	0.80	2.973 ± 0.108	1.759	0.874	44.601	31.445	49.687	1.354	45.543
No.of clusters/pl.	V16xC152	2.24	7.660 ± 0.286	19.869	5.509	48.288	25.427	27.726	2.543	27.551
	V16xs488	2.20	7.653 ± 0.296	13.186	0.292	47.445	7.056	2.214	0.165	2.159
No. of pods/pl	V16xC152	4.45	12.420 ± 0.480	34.576	7.881	47.342	22.600	22.793	2.749	22.133
	V16xs488	2.30	11.193 ± 0.433	69.014	17.814	74.220	37.708	25.812	4.415	39.446
Pod length	V16xC152	6.33-15.5	12.456 ± 1.140	4.064	0.329	16.184	4.604	8.095	0.335	2.697
No.of seeds/pl.	V16xC152	4.66-13.8	10.701 ± 0.173	4.520	2.845	19.867	15.755	62.942	2 754	25.735
	V16xs488	5.0 - 20.6	10.681 ± 0.198	5.887	2.862	22.713	16.102	50.310	2.513	23.537
Pod weight	V16xC152	3.12 - 37.3	14.199 ± 0.630	59.692	18.170	54.412	30.016	30.439	4.838	34.072
	V16xs488	2.1 - 39.5	13.104 ± 0.600	107.294	18.843	79.041	33.123	17.561	3.734	28.494
Total seed weight	V16xC152	1.0-27.5	9.562 ± 0.452	30.711	15.409	57.948	41.047	50.174	5.718	59.799
	V16xs488	1.0-27.5	9.300 ± 0.470	33.167	5.826	61.924	25.946	17.565	2.076	22.322
100 seed weight	V16xC152	6.2-14.2	9.494 ± 0.161	3.932	1.265	20.886	11.839	32.171	1.311	13 808
	V16xs488	6.0-14.8	10.052 ± 0.188	5.305	4.054	22.910	20.025	76.418	3.624	36.052

total seed weight and 100 seed weight in all the competitive plants in the F_2 populations.

Means and vairances were computed for all the characters. The genetic variance was separated from total variance following the methods of Weber and Moorthy (1952), Genotypic and Phenotypic co-efficient of variations were estimated as per the procedures given by Burton and Devane (1953). Heritability in broadsense as per the methods of Hanson et al. (1956) and Genetic advance (GA) expressed as per cent of mean was calculated as per Johnson *et al.* (1955).

RESULTS AND DISCUSSION

Wide range of variability was observed for plant height, number of branches per plant, number of seeds per plant, pod weight and total seed weight per plant in both the crosses (Table-1). Sawant (1994) also reported high GCV estimate for these characters. The difference between PCV and GCV was narrow with respect to number of seeds per plant in both the crosses indicating meagre influence of environment on this character, which resulted in comparitively high heritability coupled with high Genetic advance. Therefore, simple selection would be effective in selecting the genotypes possessing higher number of seeds per plant. The characters such as number of branches per plant and pod length in V16 x c152, while, in v16 x s488, number of clusters per plant, pod weight and number of pods per plant appeared to be more influenced by the environment (Alam et al., 1994). which reflected in the low estimates of heritability and genetic advance. For the important character of seed weight in the cross V16 x S-488, GCV and PCV were relatively high with low heritability. Interestingly, however, for this trait, genetic advance was relatively high which might be due to the existence high variability. Therefore, in spite of low heritability, simple selection for yield may be effective to a certain extent in early segregating generation.

Correlation studies (Table-2) showed highly significant and positive association of yield with number of clusters per plant, number of pods per plant and pod weight in both the crosses. Misra *et al.* (1994) and Tamilselvam and Das (1994) also reported similar results.

Path analysis (Table-3) indicated a very high direct effect of pod weight in both the crosses. It may be interesting to note that number of pods per plant exhibited high indirect effect via pod weight per plant on total seed weight in both the croses. Therefore it resulted in high correlation

Table 2. Phenotypic correlation coefficient between total seed weight and its components in F_2 population of cowpea crosses V16 x C152 (C_1) and V16 x S488 (C_2)

F_2 Population	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
C_1	1.0000	0.2826**	0.4244**	0.1827*	0.0536	0.0468	0.2859**	0.2639**	0.1112
C_2	1.0000	0.1787*	0.3288*	0.1336	0.0245	0.1207	0.0686	0.0872	0.1311
C_1		1.0000	0.5175**	0.2644**	-0.0284	0.0758	0.3150**	0.3029**	0.0642
C_2		1.0000	0.4521*	0.4790**	0.1592*	0.4144**	0.4248**	0.4135**	0.0840
C_1			1.0000	0.3554**	0.0447	0.0498	0.4934**	0.4338**	0.0789
C_2			1.0000	0.7520**	0.1875*	0.4262**	0.6211**	0.6083**	0.1724*
C_1				1.0000	0.0216	0.0620	0.6310**	0.5694**	0.0358
C_2				1.0000	0.2776**	0.4617**	0.7716**	0.7348**	0.0979
C_1					1.0000	-0.1319	0.0915	0.3073**	0.0857
C_2					1.0000	0.4407**	0.1797*	0.4142**	0.0921
C_1						1.0000	-0.0101	0.2781**	0.0857
C_2						1.0000	0.4103**	0.4665**	-0.0267
C_1							1.0000	0.9517**	0.1974*
C_2							1.0000	0.8973**	0.1854*
C_1								1.0000	0.2567*
C_2								1.0000	0.3345*
C_1									1.0000
C_2									1.0000

X_1 = Plant height; X_2 = Number of branches per plant; X_3 = Number of clusters per plant; X_4 = Number of pods per plant; X_5 = Pod length; X_6 = Number of seeds per pod; X_7 = Pod weight; X_8 = Total seed wt. (yield); X_9 = 100 seed weight

* = Significant at 5 per cent level ; ** = Significant at 1 per cent level

Table 3. Path coefficient of five yield components to yield in F_2 population of cowpea of cross V16 x C152 (C_1) and V16 x S488 (C_2)

		X_4	X_5	X_6	X_7	X_9	Ph.r
X_4	C_1	-0.0510	-0.0008	0.0033	0.6156	0.0022	0.5694**
	C_2	0.0318	0.0654	0.0133	0.6079	0.0160	0.7348**
X_5	C_1	-0.0011	-0.0373	-0.0071	0.1892	0.1636	0.3073**
	C_2	0.0088	0.2358	0.0127	0.0160	0.0151	0.4142**
X_6	C_1	-0.0031	0.0849	0.0541	-0.0098	0.1520	0.2781**
	C_2	0.0147	0.1039	0.0289	0.1415	0.0043	0.4665**
X_7	C_1	-0.0321	-0.0034	-0.0005	0.9756	0.0121	0.9517**
	C_2	0.0245	0.0423	0.0118	0.3233	0.0304	0.8973**
X_9	C_1	-0.0018	-0.0004	0.0046	0.1925	0.0616	0.2567**
	C_2	0.0031	0.0217	-0.0007	0.7879	0.1644	0.3346**

X_4 = Number of pods per plant; X_5 = Pod length (cm); X_6 = Number of seeds per pod; X_7 = Pod weight (g) / plant; X_9 = 100 seed weight (g)/plant

Residual effect = 0.1033

Note : Underlined values indicate the direct effect of that character with yield between pod weight per plant and number pods per plant and total seed weight. Accordingly, predicted genetic advance as per cent of mean for these two traits was also high. Thus, it was found that due emphasis should be given to number of pods per plant and pod weight per plant during selection of genotypes to improve seed yield in cowpea.

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COST EFFECTIVE PHOSPHOROUS MANAGEMENT PRACTICES FOR RAINFED COTTON IN VERTISOLS

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ABSTRACT

A field experiment was conducted at Agricultural Research Station, Kovilpatti to study the effect of different P sources on the yield of Cotton (variety.MCU.10) and on soil fertility status of rainfed vertisol. The results showed that the seed cotton yield was significantly increased by the application of FYM enriched Mussorie rock phosphate at 20 kgha^{-1} along withsoil application of phosphobacterium (2.0 kgha^{-1}). The same treatment significantly influenced the P uptake of the crop. Highest monetary return was realised with the application of FYM enriched Mussoorie rock phosphate along with the soil application of phosphobacterium.

KEY WORDS : P Management, Rainfed cotton, Vertisol.

Phosphorous plays a key role in the root development of any crop which is an important factor under dryfarming. Generally, the crop recovery of added chemical phosphatic fertilisers in vertisols seldom exceeds 20 to 30 per cent which might be due to the conversion of applied P sources into insoluble compounds. Consequent hike in the price of chemical fertilisers coupled with the low purchasing power of the rainfed farming community have resulted in the utilisation of natural resources such as organic and biofertilisers in crop production. Though the natural P sources, like Mussorie rock phosphate, is having the high nutrient content (20 percent P_2O_5) which is not readily available to the crop in time. To increase the use efficiency of added natural P sources, inclusion of organic mansures, and P solublizing microbes in the fertilizer schedule is necessary. Besides, the beneficial effect of substituting the mineral P sources with natural P sources like Mussoorie rock phosphate along with the phosphorous solubilizing micro organisms (PSM)