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# STUDIES ON CHARACTER ASSOCIATION AND PATH CO-EFFICIENT ANALYSIS IN COWPEA (*Vigna unguiculata* (L.) Walp.)

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Seed yield in cowpea exhibited significant and positive association with days to maturity, plant height, number of branches, clusters and pods per plant, pod length and seeds per pod. However, days to 50 per cent flowering and 100 grain weight exhibited negative association with yield. The path analysis revealed that number of primary branches per plant, days to 50 per cent flowering and pods per plant had high positive direct effect on seed yield.

Knowledge concerning yield contributing characters in a crop is of paramount importance to plant breeders for efficient selection. The estimates of correlation coefficients indicate the interrelationships of the characters. Path analysis measures the direct influence of one variable upon another and permits the separation of correlation co-efficient into components of direct and indirect effect (Dewey and Lu, 1959). The present study was undertaken to determine the characters associated with yield and their degree of association in cowpea.

## MATERIALS AND METHODS

Seven genotypes of cowpea and their twelve F1 hybrids were grown in six different environments in a randomised block design with three replications in each environment at the National Pulses Research Centre, Pudukkottai, Tamil Nadu during kharif and rabi seasons of 1984. The experimental plot consisted of two rows of 1.5 m each in each replication. The spacing adopted was 45 cm between rows and 15 cm within row. Data were recorded on five randomly selected competitive plants in each plot in each environment for seed yield and nine other metric traits. The mean data were used to compute the correlation co-efficients. The path co-efficient analyses were carried out with all the independant variable and also after deleting some of the independent variables by using the methods described by Dewey and Lu (1959).

## RESULTS AND DISCUSSION

There was positive and highly significant association between yield with days to matuirty, plant height, branches, clusters and pods per plant besides pod length and seeds per pod (Table 1). Similar observations were recorded by Dumbre *et al.* (1982), Kandasamy (1983) and Jindal and Gupta (1984) among others. There was a negative association between yield and days to 50 per cent flowering and 100 seed weight. This is

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Table 1. Correlation coefficients between yield and other characters of cowpea and multiple regression analysis

| Characters | Days to 50 percent flowering (X1) | Days to maturity (X2) | Plant height (cm) (X3) | Primary branches per plant (X4) | Clusters per plant (X5) | Pods per plant (X6) | Pod length (cm) (X7) | Seeds per pod (X8) | 100 grain weight (g) (X9) | Yield per plant (g) (Y) | Partial regression coefficient | S.E. | 't' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X1 | 1.00 | 0.871** | −0.215* | −0.054 | 0.088 | 0.058 | −0.289** | 0 225* | −0.510** | −0.157 | 1.5196 | 0.152 | 10.000** |
| X2 | | 1.000 | 0.310** | 0.312** | 0.059 | 0.014 | −0.413** | 0.059 | −0.499** | 0.283** | −1.1190 | 0.154 | 7.250** |
| X3 | | | 1.000 | 0.300** | −0.196* | 0.006 | 0.641** | 0.479** | 0.188* | 0.277** | 0.0662 | 0.007 | 9.150** |
| X4 | | | | 1.000 | 0.524** | 0.609** | 0.190* | 0.873** | −0.080 | 0.744** | 5.3349 | 0.328 | 16.233** |
| X5 | | | | | 1.000 | 0.873** | 0.369** | −0.020 | −0.338** | 0.570** | −0.1763 | 0.220 | 0.800NS |
| X6 | | | | | | 1.000 | 0.088 | 0.023 | −0.440** | 0.700** | 0.0263 | 0.271 | 0.096NS |
| X7 | | | | | | | 1.000 | 0.598** | 0.560** | 0.330** | 1.4521 | 0.704 | 2.061** |
| X8 | | | | | | | | 1.000 | −0.169 | 0.410** | −2.2902 | 0 363 | 6.300** |
| X9 | | | | | | | | | 1.000 | −0.040 | −1.2611 | 0.353 | 3.5715** |

a = 27.7099; $R^2$ = 0.4359** *Significant at 5% level; **Significant at 1% level

Multiple regression function : Y = 27.7099 + 1.5196 X1 − 1.1190 X2 + 0.0662 X3 + 5.3349 X4 − 0.1763 X5 + 0.0263 X6 + 1.4521 X7 − 2.2902 X8 − 1.2611 X9

Table 2. Path coefficient analysis showing direct and indirect effects of different characters on grain yield of cowpea

| Characters | Days to 50 percent flowering | Days to maturity | Plant height | Primary branches per plant | Clusters per plant | Pods per plant | Pod length | Seeds per pod | 100 grain weight | Correlation with yield |
|---|---|---|---|---|---|---|---|---|---|---|
| Days to 50 psr cent flowering | (0.5332) | −0.5959 | −0.0805 | −0.0521 | −0.0067 | 0.0010 | −0.0661 | −0.0904 | 0.1455 | −0.157 NS |
| Days to maturity | 0.4644 | (−0.6841) | 0.1161 | 0.3012 | −0.0045 | 0.0025 | −0.0944 | −0.0237 | 0.1424 | 0.283** |
| Plant height | −0.1146 | −0.2120 | (0.3745) | 0.2896 | 0.0149 | 0.0001 | 0.1466 | −0.1924 | −0.0536 | 0.277** |
| Primary branches per plant | −0.0287 | −0.2134 | 0.1123 | (0.9655) | −0.0399 | 0.0109 | 0.0436 | −0.1498 | 0.0228 | 0.744** |
| Clusters per plant | 0.0469 | −0.0403 | −0.0734 | 0.5059 | (−0.0762) | 0.0156 | 0.0844 | 0.0080 | 0.0964 | 0.570** |
| Pods per plant | 0.0309 | −0.0095 | 0.0022 | 0.5880 | −0.0366 | (0.0179) | 0.0201 | −0.0092 | 0.1255 | 0.700** |
| Pod length | −0.1541 | 0.2825 | 0.2400 | 0.1834 | −0.0281 | 0.0015 | (0.2287) | −0.2403 | −0.1598 | 0.330** |
| Seeds per pod | 0.1199 | −0.0403 | 0.1794 | 0.3601 | 0.0015 | 0.0004 | 0.1363 | (−0.4018) | 0.0482 | 0.410** |
| 100 grain weight | 0.2719 | 0.3414 | 0.0704 | −0.0772 | 0.0257 | 0.0078 | 0.1281 | 0.0679 | (−0.2854) | −0.040NS |

Figures in parentheses indicate direct effects. **Significant at 1% level

NS — Non Significant

Table 3. Path coefficient analysis showing direct and indirect effect of branches, clusters and pods per plant on grain yield of cowpea

| Characters | Branches per plant (X1) | Clusters per plant (X2) | Pods per plant (X3) | Correlation with yield |
|---|---|---|---|---|
| Branches per plant (X1) | (0.503) | -0.082 | 0.322 | 0.744** |
| Clusters per plant (X2) | 0.263 | (-0.156) | 0.462 | 0.570** |
| Pods per plant (X3) | 0.306 | -0.136 | (0.530) | 0.700** |

Figures in parentheses indicate direct effects

**Significant at 1% level

Multiple regression function

a = 24.3935; $R^2$ = 0.6501

Y = 24.3935 + 1.4336** X1 - 0.4462 X2 + 0.0936** X3

S. E. = (0.1932) (0.1805) (0.0209)

supported by the findings of Bordia *et al.* (1973).

The highly positive correlation values obtained for branches per plant, clusters per plant, pods per plant and seeds per pod with grain yield and the significant positive inter correlation existing among themselves revealed that these characters may be given due weightage in a breeding programme for improvement of yield. Multiple regression function (Table 1) indicated the high degree of influence of branches per plant and days to 50 per cent flowering on the expression of grain yield. The $R^2$ value indicated that approximately 43 per cent of the variations in grain yield is attributable to the characters studied.

After deleting the other independent variables except branches and pods per plant which have high positive correlation with grain yield, multiple regression function was fitted (Table 3). Efficiency of this multiple regression equation as indicated by $R^2$ was 0.6501, whereas based on nine characters it was 0.4359, which revealed the importance of branches per plant and pods per plant on the expression of grain yield.

The path coefficient analysis (Table 2) also showed that branches per plant exerted the maximum direct positive effect on grain yield followed by days to 50 per cent flowering, though it showed a negative correlation with grain yield. Plant height, pods per plant and pod length had positive direct effect on grain yield. Patel and Telang (1978) reported negative effect of pod length on grain yield in cowpea. Days to maturity had the highest negative direct effect on grain yield followed by seeds per pod, 100 grain weight and clusters per plant. Pods per plant had the lowest positive direct effect on grain yield but its indirect effect *via* branches per plant was higher.

Clusters per plant which showed significant and positive association with yield exhibited negative direct effect. This may be due to the fact the negative effect of clusters per plant might have been nullified by its high positive indirect effect *via* branches per plant. The path coefficients arrived at after deletion of some independent variables indicated that branches per plant and pods per plant had the maximum direct positive effect on grain yield. These path coefficients thus revealed that branches per plant, days to 50 per cent flowering and pods per plant contributed high positive direct effect towards yield in cowpea.

## REFERENCES

BORDIA, P.C., J. P. YADAVENDRA and S. KUMAR. 1973. Genetic variability and correlation studies in cowpea (*Vigna sinensis* (L.) Savi., ex Hasck.) *Rajasthan J. Agric. Sci. 4* : 39-44.

DEWEY, D. R. and K. H. LU. 1959. A correlation and path co-efficient analysis of components of crested wheat grass seed production. *Agron. J. 51* : 515-18

DUMBRE, A. D., R. D. DESHMUKH and A. P. PADHYE. 1982. Association of grain yield with other economic characters in cowpea. *J. Maharashtra Agrl. Univ. 7* : 154.

JINDAL, S. K. and B. S. GUPTA. 1984. Component analysis of yield in cowpea. *Indian J. agric. Sci. 54* : 183-85

KANDASAMY, G. 1983. Studies on stability of yield and component character in cowpea (*Vigna unguiculata* (L.) Walp). M. Sc. (Ag.) Thesis. Tamil Nadu Agricultutural University, Coimbatore.

PATEL, O. P. and S. W. TELANG. 1979. A path analysis of yield components in cowpea (*Vigna sinensis* L.). *JNKVV Res. J. 10* : 227-29.