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Research Note

Association analysis in the Inter subspecific crosses of Cowpea (*Vigna unguiculata* (L.) Walp.) and Yard long bean (*Vigna unguiculata* (L.) Walp. spp. *sesquipedalis*)

G.Selvakumar[1], R.Ushakumari[2]
[1] Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India.
[2] Agricultural College and Research Institute, Tamil Nadu Agricultural University (TNAU), Madurai 625 104, Tamil Nadu, India.
Email: selvakumaragri@gmail.com

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Abstract
Thirty hybrids involving six cowpea genotypes and five yard long bean and cowpea were evaluated and subjected to correlation and path analyses. The characters *viz*., number of clusters per plant, number of pods per cluster and 100 grain weight were significantly positive correlation with single plant yield. The direct effect of number of clusters per plant and 100 grain weight on single plant yield was high. Number of pods per clusters and number of seeds per pod recorded moderate and low level direct effect on single plant yield. Hence the traits, number of clusters per plant, 100-grain weight and number of pods were considered as selection indices for yield improvement programme.

Keywords: Cowpea, yard long bean, inter sub specific, correlation, path analysis

Cowpea (*Vigna unguiculata*) is extensively grown in southern India particularly in the states of Andhra Pradesh, Karnataka and Tamil Nadu. Cowpea fits well in a variety of cropping systems and is grown as cover crop, mixed crop, catch crop and green manure crop. Yardlong bean (*V. sesquipedalis*) is much more a trailing and climbing plant, often reaching 9 - 12 feet in height with pods 30 - 100 cm long and more or less inflated and flabby when young. *V. Sesquipedalis* has pods with sparse seed arrangement. *V. unguiculata* has bushy plant stature with short pod length upto 15 - 20 cm and dense seed arrangement. Here, the crosses were made between the *V. unguiculata* and *V. sesquipedalis* types to get the higher pod length with dense seed arrangement. Combining these two characters can helps to improve the yield potential of the progenies. Hence, analyzing of association characters between *V.unguiculata and V.sesquipedalis* shall give a way for improving cowpea crops. Genetic improvement of seed yield alone is not possible through phenotypic selection because of polygenic nature and low heritability. Hence selection through correlation response entailing several contributing factors which influence seed production both directly and indirectly shall be most appropriate. Therefore, an understanding of relationship between yield and its components is fundamental for selection process. This type of relationship can be explained by means of correlation and path analysis (Ene-Obong and Okoye., 1992, Azhar et al., 1999). Correlation enables breeders to estimate the strength of the relationships among various characters as well as direction of changes expected during selection. Path coefficient analysis provides a more realistic understanding of the relationship as it partitions the correlation coefficients into the direct as well as the indirect effects of the variables (Vanishere et al., 2011). Path analysis provides information on the path through which the component characters influences the expression of an economic character like yield and have been used extensively in the improvement of many crops by many workers (Ali *et al.*, 2003, Shalini *et al.*, 2000, Oyiga, and Uguru., 2011, Aruah *et al.*, 2012).

The experiment was carried out at Agricultural College and Research Institute, Madurai. Genotypes viz., GC 3, Co 6, ACM 05-07, RC 101, Co(CP)7, and ACM 05-02 belonging to *Vigna unguiculata* were used as lines. *Genotypes viz.*, Vellayani Local, Ettumanoor Local, Vyjayanthi and Vellayani jyothica belonging to *Vigna unguiculata* spp. *sesquipedalis* and VBN 2 belonging to *Vigna unguiculata* were used as testers. Crosses were made in a Line x Tester mating design. Thirty hybrids along with 11 parents were evaluated in randomized block design with three replications. The spacing adapted for F1 progenies was 60 cm x 45 cm. Recommended package of practices agronomic and pest management measures were followed. A uniform plant population of 16 plants per plot was maintained. Observations were recorded on ten plants chosen randomly in each replication. The observations taken for ten characters namely days to 50 percent flowering, plant height (cm), number of branches per plant, number of clusters per plant,

number of pods per clusters, pod length (cm), number of seeds per pod, days to maturity, 100 grain weight (g) and single plant yield (g).

The genotypic correlation between yield and its component traits and among themselves was worked out as per the methods suggested by Johnson *et al.* (1955). The significance of genotypic correlation coefficient was tested by referring to the standard table given by Snedecor (1961). Path coefficient analysis on single plant yield was carried out as suggested by Dewey and Lu (1959). The direct and indirect effects were classified based on the scale given by Lenka and Misra (1973).

Among the ten characters studied, the characters *viz*., number of clusters per plant, number of pods per cluster and 100 grain weight were significantly positive correlation with yield (Table 1). Similar results were reported by many workers (Chattopadhay *et al.,* 1997; Singh and Verma.,1998; Vardhan and Savithramma.,1998; Angela Celis de Almeida Lopes *et al*.,2001; Stoilova and Lozanov., 2001; Parmer *et al.,* 2003; Erkut Peksen *et al*., 2004; Philip 2004; Lovely 2005; Madhukumar 2006; Manju 2006; Kwaye Romanus *et al*. 2008)). Days to 50 percent of flowering had significant positive correlation with plant height, number of branches, pod length, number of seeds per pod, days to maturity and100 grain weight. Plant height had significantly positive correlation with pod length, number of seeds per pod, days to maturity and 100 grain weight, and significantly negative correlation with number of branches and number of clusters. Number of branches per plant showed significantly negative correlation with pod length. Number of clusters per plant showed significantly positive correlation with number of pods per cluster. Pod length showed significantly positive correlation with seeds per pod, days to maturity and 100 grain weight. Numbers of seeds per pod showed significantly positive correlation with days to maturity and 100 grain weight. Days to maturity showed significantly positive correlation with 100 grain weight.

The genotypic correlation coefficient of different components with grain yield were further partitioned into direct and indirect effect through path analysis (Table 2). The low residual effect indicates that the chosen traits are sufficient for the path analysis on yield. Among the traits, number of clusters per plant and 100-grain weight recorded positive and high direct effect on grain yield. Lovely (2005) also reported the number of pods per cluster had positive direct effect cowpea yield. Moderate and positive direct effect was recorded by number of pods per cluster on yield. Madhukumar (2006) and Manju (2006) were reported that number of pods per plant and pod weight were the primary yield contributing characters due to their high direct effect on pod yield. Tyagi *et al*., (2000) reported days to 50 percent flowering recorded negative direct effect on seed yield. In case of indirect effects, number of clusters and 100 grain weight recorded moderate negative and positive respectively. Other traits recorded low or negligible indirect effect on yield.

Based on the foregoing discussion on correlation and path analyses, it may be concluded that the traits number of clusters per plant, 100-grain weight and number of pods per cluster are important selection indices for grain yield improvement programme in cow pea and yard long bean inter sub specific crosses.

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Table 1. Correlation coefficients between grain yield per plant and component characters

Characters	Days to 50 percent of flowering	Plant height (cm)	No. of branches per plant	No. of clusters per plant	No. of pods per cluster	Pod length (cm)	No. of Seeds per pod	Days to maturity	100 grain weight (g)	Single plant yield (g)
Days to 50 percent of flowering	1.000	0.462**	0.278*	-0.189	-0.206	0.445**	0.444**	0.977**	0.299*	0.013
Plant height (cm)		1.000	-0.311*	-0.400**	-0.247	0.865**	0.492**	0.468**	0.543**	-0.054
Number of branches per plant			1.000	0.136	0.052	-0.279*	-0.111	0.235	0.030	0.087
Number of clusters per plant				1.000	0.608**	-0.235	-0.026	-0.186	-0.037	0.843**
Number of pods per cluster					1.000	-0.228	-0.023	-0.145	-0.149	0.622**
Pod length (cm)						1.000	0.715**	0.478**	0.650**	0.142
Number of seeds per pod							1.000	0.439**	0.467**	0.335
Days to maturity								1.000	0.342*	0.040
100 Grain weight(g)									1.000	0.390**

***** *Significant at 5% level, ** Significant at 1% level.*

Table 2. Path analysis on yield

Characters	Days to 50 percent of flowering	Plant height (cm)	No. of branches per plant	No. of clusters per plant	No. of pods per cluster	Pod length (cm)	No. of Seeds per pod	Days to maturity	100 grain weight (g)	Single plant yield (g)
Days to 50 percent of flowering	**0.172**	-0.003	-0.010	-0.132	-0.054	-0.015	0.083	-0.145	0.118	0.013
Plant height (cm)	0.079	**-0.007**	0.012	-0.280	-0.066	-0.029	0.092	-0.069	0.214	-0.054
Number of branches per plant	0.048	0.002	**-0.037**	0.095	0.014	0.009	-0.021	-0.035	0.012	0.087
Number of clusters per plant	-0.033	0.003	-0.005	**0.701**	0.161	0.008	-0.005	0.028	-0.015	0.843**
Number of pods per cluster	-0.036	0.002	-0.002	0.426	**0.265**	0.008	-0.004	0.021	-0.059	0.622**
Pod length (cm)	0.077	-0.006	0.010	-0.165	-0.060	**-0.034**	0.134	-0.071	0.256	0.142
Number of seeds per pod	0.077	-0.003	0.004	-0.018	-0.006	-0.024	**0.188**	-0.065	0.184	0.335
Days to maturity	0.168	-0.003	-0.009	-0.131	-0.038	-0.016	0.082	**-0.149**	0.139	0.040
100 Grain weight(g)	0.052	-0.004	-0.001	-0.026	-0.039	-0.022	0.088	-0.051	**0.394**	0.390**

Residual effect: 0.197

***** *Significant at 5% level, ** Significant at 1% level.*