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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, Arubah 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 and 100
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

<table>
<thead>
<tr>
<th>Characters</th>
<th>Days to 50 percent of flowering</th>
<th>Plant height (cm)</th>
<th>No. of branches per plant</th>
<th>No. of clusters per plant</th>
<th>No. of pods per cluster</th>
<th>Pod length (cm)</th>
<th>No. of Seeds per pod</th>
<th>Days to maturity</th>
<th>100 grain weight (g)</th>
<th>Single plant yield (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days to 50 percent of flowering</td>
<td>1.000</td>
<td>0.462**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>Plant height (cm)</td>
<td></td>
<td>1.000</td>
<td>-0.311*</td>
<td>-0.400**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.087</td>
<td></td>
</tr>
<tr>
<td>Number of branches per plant</td>
<td>1.000</td>
<td>0.136</td>
<td>0.052</td>
<td>-0.279*</td>
<td>-0.111</td>
<td></td>
<td>0.111</td>
<td>0.235</td>
<td>0.030</td>
<td>-0.087</td>
</tr>
<tr>
<td>Number of clusters per plant</td>
<td>1.000</td>
<td>0.608**</td>
<td>-0.235</td>
<td>-0.026</td>
<td>-0.186</td>
<td></td>
<td>-0.037</td>
<td>0.843**</td>
<td>-0.037</td>
<td></td>
</tr>
<tr>
<td>Pod length (cm)</td>
<td>1.000</td>
<td></td>
<td>-0.228</td>
<td>-0.023</td>
<td>-0.145</td>
<td></td>
<td>-0.149</td>
<td>0.622**</td>
<td>-0.149</td>
<td></td>
</tr>
<tr>
<td>Number of seeds per pod</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.143</td>
<td>-0.143</td>
</tr>
<tr>
<td>Days to maturity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.138</td>
<td>-0.138</td>
</tr>
<tr>
<td>100 Grain weight (g)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.390**</td>
<td></td>
</tr>
</tbody>
</table>

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

### Table 2. Path analysis on yield

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

Residual effect: 0.197

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