CORRELATION OF LEAF AREA TO AGRONOMIC CHARACTERS IN COWPEA

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ABSTRACT

Cowpea (Vigna unguiculata (L.) Walp) is a versatile food legume crop of the tropical and sub-tropical regions of the world (Singh et al., 1997). The average productivity of cowpea is however low because of several factors including biotic and abiotic stresses and agro-physiological constraints (Terao et al., 1997). Yield being a complex character, is affected by several direct and indirect factors. Leaf area is one such yield-attributing factor. Leaf area and other morphological characters have been found to be significantly and positively correlated with yield in some crops like brassicas (Singh et al., 2000) and pepper (Bouslama et al., 2001; Aliyu et al., 2000). Leaf area has also been found to be the trait associated with the higher yielding ability of wheat mutants (Larik et al., 1980). An important role of leaf area in determining the forage yield (biomass) in fodder crops (Rayburn, 1993) and the drought tolerance in common bean (Wright and Redden, 1998) has been recognized. As correlation studies give us an idea of the magnitude and direction of association of plant parts to the yield and yield components, the present study was undertaken to dissect completely the role of leaf area as a component of grain yield in cowpea.

Forty cowpea genotypes including 15 mutants of cultivar V-130 were included in the studies for leaf area and agronomic attributes. Each genotype was grown as a single row of 3 m length, with 45 cm inter-rows and 20 cm intra-row spacing during late kharif to pre-rabi (September-November, 2002) at the experimental field of Bhabha Atomic Research Centre, Trombay, India. Normal cultural practices were followed. Leaf samples (3 big and 3 small trifoliate leaves) at pod filling stage from three different plants of each genotype were collected, preserved between herbarium sheets and used later for leaf area measurement. The leaves were preserved in herbarium sheets as the measurement of all the leaves was not possible within short span of time. The leaf area was measured using Image analysis software Bio vis Image Plus, Ver.1.4 (Expert Vision Labs Pvt. Ltd., Mumbai). Laminar area of each leaflet of a trifoliate was measured and the total area of 3 leaflets was taken as the leaf area of a trifoliate leaf. Dates of flowering and maturity of the genotypes were recorded. The agronomic data such as plant height, number of branches and pods, pod length, seeds/pod, yield/plant and 100-seed weight were recorded at maturity. The mean data from 10 randomly selected plants of each genotype for all of the characters were computed. Coefficient of variation (CV) was computed in terms of standard deviation expressed as a percentage of the mean. Correlation between leaf area and other characters was computed using the software Microcal™Origin™Version 4.10 (Microcal Software, Inc., Northampton, USA).

The maximum variation was observed for the plant height and the minimum for the days to flowering followed by maturity (Table 1). The genotypes also exhibited considerable variation for leaf area. The least variation for days to flowering and maturity gives a more realistic picture of correlation between leaf area and other agronomic attributes.

The correlation coefficients between leaf area and other agronomic attributes are given in Table 2. The characters like number of seeds/pod (r=0.3911), yield/plant (r=0.4122) and days to maturity (r=0.3673) were significantly and positively correlated with
Table 1. Mean and variation for different characters in germplasm and mutants of cowpea

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean±SE</th>
<th>Range</th>
<th>CV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant height (cm)</td>
<td>47.90±3.54</td>
<td>19.0-135.4</td>
<td>46.69</td>
</tr>
<tr>
<td>No. of branches</td>
<td>3.44±0.17</td>
<td>1.5-5.8</td>
<td>32.00</td>
</tr>
<tr>
<td>Leaf area (mm²)</td>
<td>5913.14±205.40</td>
<td>2843.9-9340.5</td>
<td>21.97</td>
</tr>
<tr>
<td>Pods/plant</td>
<td>14.77±0.93</td>
<td>5.0-28.3</td>
<td>39.82</td>
</tr>
<tr>
<td>Pod length</td>
<td>12.89±0.29</td>
<td>7.3-18.0</td>
<td>14.38</td>
</tr>
<tr>
<td>Seeds/pod</td>
<td>10.04±0.31</td>
<td>6.0-16.1</td>
<td>19.42</td>
</tr>
<tr>
<td>Yield/plant</td>
<td>12.53±0.86</td>
<td>5.2-29.7</td>
<td>43.49</td>
</tr>
<tr>
<td>100 seed weight</td>
<td>12.40±0.61</td>
<td>7.5-22.9</td>
<td>30.92</td>
</tr>
<tr>
<td>Days to flower</td>
<td>40.13±0.53</td>
<td>32.0-47.0</td>
<td>8.41</td>
</tr>
<tr>
<td>Days to mature</td>
<td>71.85±1.32</td>
<td>58.0-92.0</td>
<td>11.65</td>
</tr>
</tbody>
</table>

Table 2. Correlation coefficients between leaf area and agronomic attributes

<table>
<thead>
<tr>
<th>Character</th>
<th>Correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant height (cm)</td>
<td>0.2436</td>
</tr>
<tr>
<td>No. of branches</td>
<td>0.1875</td>
</tr>
<tr>
<td>No. of pods/plant</td>
<td>0.0979</td>
</tr>
<tr>
<td>Pod length (cm)</td>
<td>0.2792</td>
</tr>
<tr>
<td>Seeds/pod</td>
<td>0.3911**</td>
</tr>
<tr>
<td>Yield/plant (g)</td>
<td>0.4122**</td>
</tr>
<tr>
<td>100 seed weight (g)</td>
<td>0.0047</td>
</tr>
<tr>
<td>Days to flowering</td>
<td>-0.0053</td>
</tr>
<tr>
<td>Days to maturity</td>
<td>0.3673*</td>
</tr>
</tbody>
</table>

*, ** significant at 5% and 1% respectively.

Leaf area. The other characters like number of branches and pods/plant, pod length and 100 seed weight showed insignificant positive correlation with leaf area. It can be inferred that the leaf blade area could affect grain yield indirectly through its influence on the number and size of the sites at which the photosynthates could accumulate as observed in cereals (Thorne, 1966). However, it is not possible to identify any leaf specific factor responsible for higher grain yield, as several factors like leaf duration, shade effect, NAR etc. may also influence it. Nevertheless, the positive and significant correlation between leaf area and yield observed in the study is in conformity with the findings in cereals (Thorne, 1966), brassicas (Singh et al., 2000) and pepper (Bouslama et al., 2001). The significant correlation between leaf area and maturity is in agreement with the nutritional hypothesis that a greater assimilatory supply for the production of fruit sites results in prolonged fruit production and delay in maturity (Bange and Milroy, 1998).

The present study thus revealed the positive correlation between leaf area and yield/yield components especially the number of seeds per pod. This finding can be used for selecting suitable genotypes in crossing programme for evolving desired recombinants in cowpea.

REFERENCES

Rayburn, E.B. (1993). Extension Notes, West Virginia University, USA.


