yield which was on par with the yield of Thankaikulam silt, sea weed residue, green leaf manure, farm yard manure and biogas slurry treatments. Sea weed residue also recorded higher pod yield, which is in conformity with the report of Koo (1988).

Protein content

There was a significant difference in the protein content of kernels due to the treatments. The protein content ranged from 5.69 to 17.81 percent. The treatment with the application of arecanut waste recorded the highest protein content (17.81 percent). The oil percentage ranged from 34.7 to 48.4 percent.

Total oil yield

The treatment with the application of biogas slurry recorded the highest oil percentage (48.4 percent) which was on par with pressmud applied treatment. The total oil yield ranged from 1.3 to 4.9 g/pot. The treatment with the application of arecanut waste gave the highest oil yield, which was on par with pressmud applied treatment. The higher content of oil content in biogas slurry applied treatment is due to high content of N, P and K. Balanced supply of these three nutrients play a major role. This is in conformity with the results of Rani Perumal et al., (1978).

REFERENCES


HETEROSES STUDIES IN BITTERGOURD (Monordica charantia)

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ABSTRACT

Four lines were crossed with fifteen testers and the resultant sixty hybrid combinations, were evaluated along with their parents for heterosis, for fruit yield and their component characters. Observations were recorded on 12 yield component characters. Appreciable amount of heterosis was observed for all the characters under study. The F1 hybrids L3 x T1 (Pusa Vissh x MC.13) L2 x T4 (MC. 84 x MDU.1), and L11 x T1 (DPH. 21 x MC.13) gave the highest fruit yield per vine and they showed 65.74, 61.02 and 48.04 per cent heterosis for yield over the standard variety (MC.84). The best performing F1 hybrid of the study L2 x T1 (Pusa Vissh x MC.13) recorded 65.74 per cent heterosis over the standard variety (MC.84) and 49.00 per cent heterosis over the better parent (MC.13).

KEY WORDS : Bitter Gourd, Heterosis

Bittergourd (Monordica charantia L.) is one of the most important nutritious cucurbitaceous vegetables, known for its peculiar characteristic bitter taste. It is highly cross pollinated and its monococious nature has resulted in variations in several qualitative and quantitative characters. Despite of it importance and adaptability not much work has been done especially in crop improvement aspects. The present investigation was taken up using a 4 x 15 line x tester crossing system to produce promising F1 hybrids in this crop.

MATERIALS AND METHODS

The bittergourd material chosen for this study consisted of 15 lines and four testers which were crossed using the Line x Tester making system to produce 60 hybrids. The parents used were Co.1 (L1), MC.84 (L2), Pusa Vissh (T3), Coimbatore local (L4), Perumbavoor local (L5), Vadakkanthiri...
Table 1. Heterosis and superior F1 - combinations for 15 x 4 Line x Tester analysis in bittergourd:

<table>
<thead>
<tr>
<th>Character</th>
<th>Range of heterosis over better parent (%)</th>
<th>Three top performing combinations with heterosis (% in parenthesis) over best check for different characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vine length (m)</td>
<td>-30.37 to 43.50</td>
<td>L₁₀ x T₁ (71.24)</td>
</tr>
<tr>
<td>Number of primary branches per vine</td>
<td>-35.98 to 39.62</td>
<td>L₂ x T₃ (41.59)</td>
</tr>
<tr>
<td>Node number of first female flower production</td>
<td>-56.52 to 47.73</td>
<td>L₁₀ x T₁ (55.39)</td>
</tr>
<tr>
<td>Days to first harvest</td>
<td>-15.96 to 19.94</td>
<td>L₁₀ x T₁ (30.23)</td>
</tr>
<tr>
<td>Fruit length (cm)</td>
<td>-47.71 to 22.71</td>
<td>L₁₀ x T₁ (22.48)</td>
</tr>
<tr>
<td>Fruit diameter (cm)</td>
<td>-45.59 to 31.33</td>
<td>L₁₀ x T₁ (19.92)</td>
</tr>
<tr>
<td>Fruit flesh thickness (cm)</td>
<td>-43.40 to 14.00</td>
<td>L₁₀ x T₁ (16.82)</td>
</tr>
<tr>
<td>Edible portion of fruits (%)</td>
<td>-24.59 to 18.89</td>
<td>L₁₀ x T₁ (16.59)</td>
</tr>
<tr>
<td>Number of fruits per vine</td>
<td>-48.42 to 77.95</td>
<td>L₁₀ x T₁ (14.05)</td>
</tr>
<tr>
<td>Mean fruit weight (kg)</td>
<td>-68.89 to 32.11</td>
<td>L₁₀ x T₁ (13.10)</td>
</tr>
<tr>
<td>Fruit field per vine (kg)</td>
<td>-64.41 to 49.00</td>
<td>L₁₀ x T₁ (11.78)</td>
</tr>
<tr>
<td>Crop duration (days)</td>
<td>-11.55 to 9.37</td>
<td>L₁₀ x T₁ (8.74)</td>
</tr>
</tbody>
</table>

local (L₆), Pudur local (L₇), Coimbatore long green (L₈), Udayamartandom local (L₉), Ottanchathram local (L₁₀), DFH.21 (L₁₁), DFH.77 (L₁₂), DFH.55 (L₁₃), DFH.72 (L₁₄), MC.47 (L₁₅), MC.13 (T₁), VK.1. Priya (T₂), Arka Harit (T₃) and MDU.1 (T₄).

A total of 60 F₁ hybrids and their respective parents were raised in a randomised block design with three replications during June - November, 1993. An interrow spacing of 2.5 m and intrarow spacing of 2.0 m was adopted and the vines were trained to pandal. Four seeds per pit were sown to obtain a good stand, but only two seedling per pit was retained, making a total of eight seedlings per genotype per replication. Observations were recorded on eight plants per replication on 12 important characters. Heterosis was calculated as the percentage of F₁ performance in the favourable direction of its better parents (dii) as well as standard variety (diii) for each character. The best parental lines were established individually for different characters based on their performance in the line X tester mating system. Accordingly L₂
RESULTS AND DISCUSSION

The range of heterosis percentage in F1 crosses varied from 9.37 (crop duration) to 77.95 (number of fruits per vine) over better parental values (Table 1). Out of 60 F1 hybrids, the heterotic effects over better parents were observed in 24 crosses for vine length, 30 for number of primary branches per vine, 46 for node number of first harvest, 5 for fruit length, 3 for fruit diameter, 13 for fruit flesh thickness, 20 for edible portion of fruits, 39 for number of fruits per vine 10 for mean fruit weight, 19 for fruit yield per vine, and 10 for crop duration. Highly significant differences were observed among the treatments.

Among the parents, Pudur local (L7) and Arka Harit (L3) were the earliest in days to first harvest, and lower node number of first female flower production and lesser crop duration. The ovule parent Pusa Visesh (L3) performed better in characters like fruit diameter and mean fruit weight, while the male parent T1 performed better for vine length, number of primary branches, fruit flesh thickness, edible portion of fruits, number of fruits per vine and fruit yield per vine. The parent L2 performed best for characters like number of primary branches, and fruit yield per vine, whereas L12 gave highest vine length and number of fruits per vine. The highest fruit length was observed in parent L5, fruit flesh thickness in L43 and edible portion of fruits in L4. The male parent T4 performed best for fruit length, and mean fruit weight. The superiority of L3 (Munshi, 1991), L2 (Devadas, 1993), L1 and L8 (Lawande and Patil, 1990) and T4 (Gopalakrishnan, 1986) for various yield components have been reported earlier.

The range of heterosis over better heterotic effect of F1 hybrids exhibiting the highest percentage of heterosis when compared the standard variety for different characters included. Earlier Ranpise (1985); Gopalakrishnan (1985), Lawande and Patil (1989) and Devadas (1993) have also reported standard heterosis in bettergourd.

The first top three hybrids L3 x T1, L2 x T4 and L1 x T1 showed 65.74, 61.92 and 48.04 percent heterosis. It was observed that the total yield of fruits per plant in bettergourd is mainly dependent upon the fruit-weight and number of fruits per plant. The number of fruits per plant influenced by the size of the fruits (length and diameter) and vegetative vigour (vine length and branching). The fruit weight increases or decreases depending upon the number of fruits and size of fruits. The seeds per fruit and seed weight per fruit are also directly related to the size of the fruits. Early fruiting tends to produce large number of fruits. The results indicated that from the economic point of view, it was useful to utilise the parental lines having important characters like earliness, vegetative vigour, and higher fruit size, number and weight associated with yield in order to achieve higher yields in F1 hybrids of bettergourd.

The best F1 hybrids L2 x T1 (Pusa Visesh x MC.13) which gave 65.74 percent higher yield over the standard variety MC.84 (L2) can be exploited for commercial cultivation.

REFERENCES


