Heterosis for Yield in a Watermelon Hybrid

Gabriele Gusmini and Todd C. Wehner
Department of Horticultural Science, North Carolina State University, Raleigh, NC 27695-7609

Heterosis in watermelon (Citrullus lanatus (Thunb.) Matsum. & Nakai)), as well as general (GCA) and specific (SCA) combining ability, received much attention in the 1950s and 1960s. Much of the research was done in India (1, 2, 4, 5, 7-10), and was based on diallel or top crosses of elite inbreds, rather than a random set of lines originating from a single population. Overall, these studies indicated the presence of heterosis in watermelon and the importance of GCA in the choice of parents for hybrid production. Two recent studies were run in Brazil on seven intercrossing populations with evaluation of reciprocal crosses (3) and tetraploid females crossed with diploid males for the production of triploid seeds (11). The presence of heterosis in watermelon, and the importance of parents and direction of the crosses was confirmed. The objective of this study was to measure heterotic effects in a hybrid of two important watermelon cultivars. Our data were collected in a replicated trial of the inbred cultivars 'Allsweet' and 'Jubilee' and their F₁ hybrid.

Methods: The experiment was conducted in the summer of 2001 and 2002 at the Horticultural Crops Research Station at Clinton, North Carolina (4 replications/year) and at the Cunningham Research Station at Kinston, North Carolina (2 replications, 2002 only). The experiment at Clinton was a randomized complete block. Rows were direct seeded on raised, shaped beds with rows 3.1 m apart. Plots were 3.7 m long, with 0.6 m between hills, and 2.5 m alleys at each end of the plot. In Kinston, rows were covered with black polyethylene mulch and drip irrigated. The experiment was conducted using recommended practices (6). Plots were harvested twice (26 July and 9 August) in Clinton in 2001, once (25 July) in Clinton in 2002, and twice (23 July and 6 August) in Kinston in 2002 for fruit yield and quality measurements. Data were analyzed using the MEANS, CORR, and GLM procedures and the LSD option of SAS-STAT Statistical Software Package (SAS Institute, Cary, NC). High parent heterosis was calculated as percentage increase of the F₁ hybrid value over the best parent value.

Results: The F₁ hybrid evaluated had 22% more total fruit weight and 32% more total fruit number than 'Jubilee', the best parent (Table 1). There was no difference in percentage marketable fruit in the parents or F₁ hybrid. Average fruit size was similar in 'Jubilee' and the F₁ hybrid, with 'Allsweet' significantly smaller. High parent heterosis was significant for fruit number, but not for fruit weight. It appears that there is high parent heterosis for yield in the 'Allsweet' x 'Jubilee' hybrid.

Literature Cited

Table 1. Yield for two inbred parents and their F₁ hybrid evaluated in trials of two years, two locations, one or two fields, and two replications.

<table>
<thead>
<tr>
<th>Cultivar or statistic</th>
<th>Total weight y (Mg/ha)</th>
<th>Total number y (th/ha)</th>
<th>Marketable weight y (%)</th>
<th>Fruit size y (kg/fruit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allsweet</td>
<td>65.9 b</td>
<td>6.8 b</td>
<td>94 a</td>
<td>9.8 b</td>
</tr>
<tr>
<td>Jubilee</td>
<td>87.9 ab</td>
<td>7.4 b</td>
<td>93 a</td>
<td>12.9 a</td>
</tr>
<tr>
<td>F₁ hybrid</td>
<td>107.1 a</td>
<td>9.8 a</td>
<td>96 a</td>
<td>11.5 a</td>
</tr>
<tr>
<td>HP Heterosis z</td>
<td>22%</td>
<td>32%</td>
<td>2%</td>
<td>-</td>
</tr>
</tbody>
</table>

Correlation (tot. weight vs. market. weight) 0.98 **
Correlation (tot. no. fruits vs. market. fruit no.) 0.96 **
Correlation (% market. weight vs. % market. fruit no.) 0.97 **

** r-value significant at p-value<0.01

 Equal letters correspond to statistically equal means, based upon Fisher's Protected LSD

 z High Parent Heterosis = [(F₁-HP)/F₁]*100; only where HP > F₁, based upon LSD