more staminate nodes than those treated at the 2-leaf stage (Table 1).

It has been our experience with AgNO₃ solutions that Ag⁺ reacts with anions in tap water and precipitates, thus decreasing the effectiveness in inducing staminate flower production on gynoecious lines. In the second experiment the quality of water used to prepare the AVG solutions influenced staminate flower induction although precipitation was not observed in AVG solutions prepared with tap water. Plants treated with AVG solutions prepared with DD H₂O had staminate flowers earlier and at more nodes than plants treated with AVG prepared with tap water (Table 1). The reason for this is not known.

A significant effect of gynoecious lines was observed only for total number of staminate nodes in the time of application experiment. The line x AVG concentration interaction was not significant in either experiment for either the first or total number of staminate nodes. This implies that the 3 gynoecious lines responded similarly to AVG treatment. Several significant interaction effects were observed for total number of staminate nodes in both experiments. AVG treatments at 100 and 200 ppm caused chlorosis of the leaves 2-3 days after application. The chlorosis disappeared in 7-10 days, except for small areas. A slight reduction in growth was observed in plants treated with AVG. Plants treated with 100 or 200 ppm AVG had clusters of staminate flowers at several nodes on the main stem and laterals, as is commonly observed with AgNO₃. Additional experiments will be performed to compare AVG with AgNO₃ and GA₄/7 for effectiveness in inducing staminate flowers on gynoecious cucumbers in the field.

Literature Cited


Linkage of Bacterial Wilt Resistance and Sex Expression in Cucumber¹

A. F. Iezzoni and C. E. Peterson²
Department of Horticulture, University of Wisconsin, Madison, WI
53706

Additional index words. Cucumis sativus, Erwinia tracheiphila

Abstract. A strong linkage (~ 1 crossover unit) was detected between the gene Bw for resistance to bacterial wilt incited by Erwinia tracheiphila (E. F. Smith) Holland and the gene M for pistillate vs. perfect flowers in cucumber (Cucumis sativus L.).

Sex expression in cucumber is controlled by 2 major loci. M/m plants have perfect flowers while m/m plants have perfect flowers (2, 8, 9). The F locus controls the number of staminate nodes on the main stem prior to pistillate or perfect flower production (2, 9, 10). The F and M loci segregate independently resulting in 4 sex types (7). Disregarding the influence of modifying genes and environmental factors upon the F locus the sex types are: MF monocious, MF gynoecious, mf andromonocious, mf hermaphroditic.

Resistance to bacterial wilt was reported in PI 200818 from Burma in 1956 (4). Nuttall and Jasmin (5) reported that resistance was controlled by a single dominant gene, Bw (7). Difficulty in transferring bacterial wilt resistance among the sex types prompted a study of the segregation between the Bw locus and the loci controlling sex expression. Preliminary investigations revealed independent assortment of the Bw and F loci. The objective of this study was to determine whether the Bw and M loci segregate independently.

Cucumber lines either resistant or susceptible to bacterial wilt were established for each of the four sex types. Appropriate crosses were made in the greenhouse to study the segregation of the M and Bw genes. Each F₁ was backcrossed to the double recessive parent and the F₁8 in coupling phase were selleed to produce F₂ seed. In 1978, plants from 4 BC coupling, 3 BC repulsion, and 4 F₂ coupling populations were grown in the greenhouse in a standard soil mix with one plant per 13-cm pot. Each plant was inoculated with bacterial wilt as soon as it was possible to determine sex type.

Bacterial wilt inoculum was prepared by crushing infected cucumber internodes and petioles in a few drops of water. A flower holder with 65 needles (2.25 cm²) was used for the inoculation by puncturing the healthy plant leaves (1). Infected tissue was attached to the needles of the holder to absorb and carry the inoculum. Bacterial wilt symptoms appeared in 1-2 weeks after inoculation and the plants were then

<table>
<thead>
<tr>
<th>Generation</th>
<th>Phase</th>
<th>Observed ratio</th>
<th>Expected ratio</th>
<th>χ²</th>
<th>Probability</th>
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</thead>
<tbody>
<tr>
<td>Backcross</td>
<td>Coupling</td>
<td>1M:1m</td>
<td>250:271</td>
<td>.85</td>
<td>25-50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1Bw:1bw</td>
<td>250:271</td>
<td>.85</td>
<td>25-50%</td>
</tr>
<tr>
<td>Backcross</td>
<td>Repulsion</td>
<td>1M:1m</td>
<td>156:156</td>
<td>.01</td>
<td>90-95%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1Bw:1bw</td>
<td>156:156</td>
<td>.01</td>
<td>90-95%</td>
</tr>
<tr>
<td>F₂</td>
<td>Coupling</td>
<td>3M:1m</td>
<td>312:142</td>
<td>9.54</td>
<td>&lt;0.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3Bw:1bw</td>
<td>321:133</td>
<td>4.47</td>
<td>5-2.5%</td>
</tr>
</tbody>
</table>

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²Research Assistant and Research Horticulturist, respectively.
Table 2. Joint segregation of the M and Bw alleles in backcross and F2 progenies.

<table>
<thead>
<tr>
<th>Phenotype of cross</th>
<th>Genotypes</th>
<th>Progeny distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Pistillate, resistant x perfect, susceptible)(F_1) x perfect susceptible</td>
<td>Coupling</td>
<td>Pistillate, resistant</td>
</tr>
<tr>
<td></td>
<td>M Bw/m bw x m bw/m bw</td>
<td>250</td>
</tr>
<tr>
<td>(Pistillate, susceptible x perfect, resistant)(F_1) x perfect, susceptible</td>
<td>Repulsion</td>
<td>2</td>
</tr>
<tr>
<td>(Pistillate, resistant x perfect, susceptible)(F_2)</td>
<td>Coupling</td>
<td>M Bw/m bw x m bw/m bw</td>
</tr>
<tr>
<td></td>
<td>M Bw/m bw self</td>
<td></td>
</tr>
</tbody>
</table>

classified for sex and bacterial wilt reaction. Plants were classified as resistant, no wilting; or susceptible, chlorosis and wilting of the inoculated leaf distal to the point of inoculation. Tests of homogeneity determined that data from the various subpopulations for each cross could be combined. Linkage intensity from the F2 population was calculated by the product method (3).

Bacterial wilt segregation was consistent with a single gene hypothesis, as previously reported (5). Segregation at the M locus showed a good fit to the expected 1:1 ratio in the BC populations. In all of the F2 data however, the poor fit to a 3:1 ratio was unexpected and is being investigated (Table 1).

A strong linkage was detected between the Bw locus for bacterial wilt resistance and the M locus for pistillate vs. perfect flowers (Table 2). There were no recombinant types among the 521 BC coupling offspring, but 4 recombinant phenotypes were observed in the BC repulsion population representing 1.3% recombination. In the F2 population, 11 out of 454 plants were non-parental types indicating 1.1% recombination.

The ‘Lemon’ type of cucumber is andromonoecious, bearing staminate flowers and perfect flowers with small round ovaries. Robinson (6) reviewed the surprisingly large number of characters that distinguish the ‘Lemon’ type and are linked to or are pleiotropic effects of the m locus. The gene for bacterial wilt resistance can be added to the growing list of genes that are tightly linked to the M loci.

Literature Cited


Effect of High Soil Moisture on Quality of Muskemelon

John A. Wells and Perry E. Nugent

U.S. Department of Agriculture, Science and Education Administration, Agricultural Research, U.S. Vegetable Laboratory, Charleston, SC 29407

Additional index words. Cucumis melo, cantaloupe, soluble solids, ascorbic acid, melon breeding

Abstract. ‘Edisto’ and ‘Saticoy Hybrid’ muskmelon (Cucumis melo L.) were grown at 2 soil moisture levels. Soil moisture was negatively correlated with soluble solids content (SSC) in the fruit of both cultivars and negatively correlated with dry matter, ascorbic acid, β-carotene, and sucrose content in ‘Edisto’ and with ascorbic acid content in ‘Saticoy’. In both cultivars, SSC was highly correlated with ascorbic acid, sucrose, and dry matter content. The SSC, a commonly used measure of fruit quality, may be misleading unless the effect of soil moisture is considered.

We have found that the soluble solids content (SSC) of muskmelon declines when heavy rainfall occurs during the final stages of fruit development (unpublished data). The effect of soil moisture on SSC or sugar content in muskmelons has been reported to be insignificant (4, 5) or positive (1) in various studies, probably depending on the conditions under which the studies were made and on the cultivar studied. Indeed, Bouwkamp et al. (3) reported that rainfall can affect SSC of melons either positively or negatively, depending on cultivar. They also reported that SSC was most influenced by rainfall during the 5 days preceding harvest. SSC is commonly used by breeders as a selection criterion for improving fruit quality. The use of this criterion necessitates distinguishing between environmental factors and the genetic effect being sought. Recently, the use of SSC as the sole criterion of quality has been questioned (2, 11). The eating quality of a melon is determined by a number of factors, not all of which correlate well with SSC. However, SSC is highly correlated with sugar and ascorbic acid content (AAC) (9), 2 factors which we consider important to overall quality. Thus, if rainfall affects SSC, it might also affect AAC, sugar content and perhaps β-carotene content. Furthermore, since SSC can be determined rapidly, it will probably continue to be used by breeders as a first approximation of quality when screening large numbers of fruit.