Additional index words. Cucumis melo

Three male-sterile genes are available for use in hybrid muskmelon (Cucumis melo L.) seed production. Although ms-1 and ms-2 were described in 1949 (2) and 1964 (1), they have been used little, if at all, for commercial hybrid seed production. It is too soon to predict the usefulness of ms-3, because it was only recently described (5). In a previous study of phenotypic variation of ms-1 and ms-2 segregates, I showed that fertile plants produce at a low frequency aberrant staminate flowers that might be mistakenly identified as male sterile (4).

Reliable and rapid means of identifying male-sterile plants are essential if male-sterility is to be economically and biologically useful for hybrid seed production. In the course of determining the developmental stage at which fertile and male-sterile plants could be distinguished, I discovered that fertile plants produce at a low frequency aberrant staminate flowers that might be mistakenly identified as male sterile (4).

For hybrid muskmelon production.

Two greenhouse studies were done. Minimum day/night greenhouse temperatures maintained during these studies were 30/18°C. Natural lighting was not artificially supplemented during either study. Seeds were planted in Jiffy peat pellets; seedlings were transplanted into sand in 20-cm plastic pots at the 1 to 2 true leaf stage. Plants were watered with a 1:300 with (nutrient solution:water) dilution of standard Hewitt nutrient solution modified as previously described (6). In each study, the phenotype (with respect to male-sterility) of each plant was determined by evaluating one flower at anthesis on different days prior to the study.

In Table 1, reliability (percentage of agreement) of pre-anthesis classification of muskmelon flowers for male-sterility in a muskmelon progeny segregating for ms-1 and ms-3.

Table 1. Reliability (percentage of agreement) of pre-anthesis classification of muskmelon flowers for male-sterility in a muskmelon progeny segregating for ms-1 and ms-3.

<table>
<thead>
<tr>
<th>Days after planting</th>
<th>Time of classification (hr)</th>
<th>Percent agreement with pre-anthesis classification</th>
<th>Anthesis Phenotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>0800-1000</td>
<td>22</td>
<td>88</td>
</tr>
<tr>
<td>34</td>
<td>0800-1000</td>
<td>25</td>
<td>88</td>
</tr>
<tr>
<td>35</td>
<td>1100-1300</td>
<td>42</td>
<td>100</td>
</tr>
<tr>
<td>38</td>
<td>1430-1530</td>
<td>72</td>
<td>100</td>
</tr>
</tbody>
</table>

*Phenotype based on 3 flowers of each plant evaluated at anthesis on different days prior to the study.
Fig. 1. Muskmelon anthers one day prior to anthesis. A. fertile. B. male sterile-1. C. male sterile-2. D. male sterile-3. (x 14).

anthers, but were obvious on sterile anthers, especially on sterile ms-2 anthers (3). The stomium, which was barely visible on fertile anthers, was readily seen on anthers of male-sterile ms-1 plants (3). Anthers on male-sterile ms-3 plants had a wax-like appearance.

At anthesis, anthers on fertile plants were yellow and covered with pollen as a result of the disintegration of the pollen sac (3). Anthers on male-sterile ms-1, ms-2, and ms-3 plants were also yellow. Anthers on male-sterile ms-1 and male-sterile ms-2 plants were shrunken compared with their pre-anthesis appearance and compared with anthers on fertile plants at both pre-anthesis and anthesis. The stomium was not readily visible on anthers of male-sterile ms-1 plants at anthesis. Anthers on male-sterile ms-3 plants still had a wax-like appearance.

Test II: Effect of time of day on evaluation of anthers at pre-anthesis. One family that was segregating for ms-1 and ms-3 was planted 1 Apr. 1983 and transplanted 15 Apr. Anthers were evaluated 4 times over a 6-day period from 4 to 9 May. The number of flowers evaluated per day (one flower per plant) ranged from 22 on the first day to 72 on the 4th day. Evaluations on the first 2 days were done before 1000 HR; evaluations on the last 2 days were done after 1100 HR.

The percentage of agreement of pre-anthesis evaluation of male-sterility with anthesis evaluation of male-sterility and phenotype were 88% and about 83%, respectively, when pre-anthesis evaluations were done before 1000 HR (Table 1). When pre-anthesis evaluations were done after 1100 HR, the respective frequencies were 100% and about 99% (Table 1). Thus, flowers evaluated 18 hr or less prior to anthesis were more reliable for evaluating male-sterility.

The differences in agreement of pre-anthesis evaluations done prior to 1000 HR and those done after 1100 HR appeared to be related to variation in flower development as indicated by the amount of chlorophyll in the corolla. Flowers at pre-anthesis with predominantly yellow corollas are more suitable for evaluation of male-sterility than flowers with predominantly green corollas.

Pre-anthesis evaluation of male-sterility potentially can reduce both the uncertainty and the number of days spent in selecting male-sterile plants in families segregating for male-sterility. Evaluation at anthesis can be done in the field for only short periods of time each morning because of contamination of flowers by bees, other insects, or rainfall. Pre-anthesis data can be obtained later on the same day to confirm anthesis evaluation of male-sterility. These data indicate that plants can be evaluated for sterility at pre-anthesis from late morning through late afternoon and early evening, a period of 5–9 hr, depending upon location and season.

Literature Cited