content, 2.07% Ca. Despite the fact that Ca application increased fruit firmness, there was no correlation between the amount of Ca accumulated by the fruit and the degree of firmness. However, the highest fruit firmness obtained was associated with the highest Ca concentration in the fruit.

**Shelf-life.** Fruits harvested from bushes treated with Ca and stored at 5°C were fresh, attractive, and without wrinkles or shriveling. In comparison with fruits from non-treated bushes, the former maintained their postharvest keeping quality and marketability for approximately 17 days before signs of postharvest problems and senescence became obvious.

**Literature Cited**


**POLLEN PRODUCTION AND CROSS COMPATIBILITY IN LOW-CHILL JAPANESE-TYPE PLUM**

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Additional index words. Pollen germination, plum breeding, fruit set.

**Abstract.** Twenty-three low-chill clones of Japanese-type plum (P. salicina Lindl. and hybrids) from the University of Florida breeding program were evaluated at Gainesville, Florida in 1992 for pollen production and germinability. Three clones in advanced tests were evaluated for self- and cross-compatibility. Visible pollen shed in the field occurred in all but Fla. 86-3 and Fla. 87-4. Pollen production, as measured per micro-

compatible. Poor pollen tube growth may result in apparent incompatibility in some genotypes (Carvalh and Raseeira, 1992). Cross-pollination is generally required for good fruit set under commercial conditions even though good cross-pollination may increase fruit set to the point where fruit thinning may become a problem.

This study was conducted to determine pollen production and viability in 23 clonal selections from the Florida breeding program and to determine the self- and cross-compatibility of 'Gulfruby', Fla. 85-3, and Fla. 87-7. The latter two clones are currently thought to have commercial cultivar potential.

### Materials and Methods

In spring of 1992, single flowering shoots about 8-10 inches long of 'Gulfruby', Fla. 85-3, and Fla. 87-7 were chosen in the field. Ten flowers on each twig were hand-emasculated just prior to opening, self-pollinated, and bagged to prevent outcrossing. The ten flowers were removed 5 days later and fixed in formalin, acetic acid, and ethyl alcohol 1 : 1 : 8. After being rinsed 3 times in distilled water, they were transferred to 1N NaOH to soften for 2 hours, rinsed in distilled water 3 times, stained in water soluble aniline blue (0.1% dissolved in 0.1 N K₂PO₄) for 5 hours, and mounted in glycerine. The cover slip was pressed downward gently to flatten the tissue. Fluorescent microscopy was then used to determine pollen germination and subsequent tube growth.

Additional shoots of 'Gulfruby' and the selections Fla. 85-3 and Fla. 87-7 were bagged in the field after all open flowers were removed. Each clone was selfed and crossed with the other 2 clones with and without emasculation. One shoot about 10 to 12 inches in length with approximately 100 flowers, was used for each type of pollination and emasculation treatment. Bags were removed at 2-3 day intervals for hand-pollinations. Day temperatures (°F) were in the 70's and night temperatures in the 50's. The bags were removed after petal fall was complete.

To determine pollen production and germinability, pollen was collected from 20 flowers from each of 23 clones. After storage at 45°F for 5 days the dry pollen from each clone was sampled by brushing a pencil eraser back and forth several times in the small polyethylene bag containing the pollen. The eraser was then swirled in 3 drops of a 10% sucrose solution in the well of a microscope slide to dislodge the pollen. The sucrose solution ensured even distribution of pollen. This method provided an estimate of how much pollen was produced per clone. Pollen germination was observed at 100X from 4 microscopic fields for each clone. Data for pollen viability were analyzed using SAS (1).

Field ratings were also given to each of the 25 clones for crop load using a rating of 1-10; a rating of 5 is 50% commercial crop.

### Results and Discussion

Pollen from self pollinated 'Gulfruby', Fla. 85-3 and Fla. 87-7 germinated and penetrated less than half the length of the style in 5 days (data not shown). Fertilization in plum has been demonstrated to occur in less than 5 days after compatible pollinations (Tereza et al.). No bagged twig, with or without emasculation, set fruit in selfed hand-pollinations of 'Gulfruby', Fla. 85-3, and Fla. 87-7 (Table 1), indicating self-incompatibility. Thus, these 3 clones were judged self unfruitful. All bagged cross-pollinations of the 3 clones set some fruit when flowers were not emasculated. Generally, fruit set was reduced when flowers were emasculated. This indicates that all 3 clones are cross fruitful.

Pollen production in the field, amount of pollen per microscopic slide, and germination percentages in the laboratory were determined for 23 clonal selections from the Florida breeding program (Table 2). All clones except Fla. 86-3 and Fla. 87-4 visibly shed pollen under field conditions when ripe anthers were lightly rubbed between the fingers and dusted onto the hand. All of the clones produced pollen as seen under the microscope. Although the method we used to estimate the amount of pollen produced was not precise, it allowed us to determine relative differences among clones. A sample from a low pollen producing clone constituted a larger proportion of the total pollen in its bag than a sample from a high pollen producing clone, thus, pollen counts from the lowest producers may have been overestimates and those from the highest producers, underestimates. Nevertheless, some clones were obviously proficient and others deficient in pollen production.

### Table 1. Number of fruit on emasculated (E) and non-emasculated (NE) twigs of Fla. 87-7, 85-3, and 'Gulfruby' that were hand pollinated and bagged. One 10 to 12 inch twig (about 100 flowers) was used for each treatment.

<table>
<thead>
<tr>
<th>Clone</th>
<th>E</th>
<th>NE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fla. 85-3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fla. 87-7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>'Gulfruby'</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table 2. Pollen production and germination in Florida low-chill plums.

<table>
<thead>
<tr>
<th>Clone</th>
<th>Pollen shed in field</th>
<th>Fruit set a in field</th>
<th>Pollen density b (no)</th>
<th>Germination a (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fla. 79-5</td>
<td>YES</td>
<td>3</td>
<td>56</td>
<td>0</td>
</tr>
<tr>
<td>Fla. 85-1</td>
<td>YES</td>
<td>8</td>
<td>140</td>
<td>7</td>
</tr>
<tr>
<td>Fla. 85-2</td>
<td>YES</td>
<td>6</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>Fla. 85-3</td>
<td>YES</td>
<td>5</td>
<td>68</td>
<td>12</td>
</tr>
<tr>
<td>Fla. 86-1</td>
<td>YES</td>
<td>1</td>
<td>52</td>
<td>5</td>
</tr>
<tr>
<td>Fla. 86-2</td>
<td>YES</td>
<td>1</td>
<td>65</td>
<td>14</td>
</tr>
<tr>
<td>Fla. 86-3</td>
<td>NO</td>
<td>1</td>
<td>75</td>
<td>4</td>
</tr>
<tr>
<td>Fla. 86-4</td>
<td>YES</td>
<td>10</td>
<td>72</td>
<td>10</td>
</tr>
<tr>
<td>Fla. 86-5</td>
<td>YES</td>
<td>8</td>
<td>69</td>
<td>11</td>
</tr>
<tr>
<td>Fla. 86-6</td>
<td>YES</td>
<td>10</td>
<td>48</td>
<td>13</td>
</tr>
<tr>
<td>Fla. 86-7</td>
<td>YES</td>
<td>2</td>
<td>76</td>
<td>0</td>
</tr>
<tr>
<td>Fla. 86-8</td>
<td>YES</td>
<td>6</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Fla. 86-9</td>
<td>YES</td>
<td>10</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Fla. 87-1</td>
<td>YES</td>
<td>10</td>
<td>161</td>
<td>12</td>
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<tr>
<td>'Gulfruby'</td>
<td>YES</td>
<td>8</td>
<td>38</td>
<td>3</td>
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<td>YES</td>
<td>10</td>
<td>122</td>
<td>2</td>
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<td>'Gulfruby'</td>
<td>YES</td>
<td>10</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>'Gulfruby'</td>
<td>YES</td>
<td>10</td>
<td>52</td>
<td>3</td>
</tr>
</tbody>
</table>

aRating 1 to 10 or 10 to 100 percent of a full commercial crop.
bAverage of 4 microscopic fields observed at 100X.
production. Four clones had 122 to 201 pollen grains per microscopic field, 15 clones had 51 to 96 grains, and 4 clones had 3 to 21 grains. Clones differed both in pollen production and in percentage pollen germination at the 99% probability level as determined by a mean separation test. Fla. 86-7, Fla. 86-9, Fla. 87-4, and Fla. 79-3 produced no viable pollen and were rated sterile. Pollen germination was between 10% and 26% for nine clones which were rated good. Ten clones were rated intermediate at 2% to 7% germination.

Clones Fla. 86-1, -2, and -3, 86-7, and 79-3 produced much less than half a commercial crop despite ample overlap of polycross pollen, good honey bee activity, and good pollination conditions. These five clones are not recommended for further testing.

Conclusions

The cultivar ‘Gulfruby’ and the clones Fla. 85-3 and Fla. 87-7 are all self-unfruitful, but are cross-fruitful. It is, therefore, essential that prospective growers of any of these three plums use a combination of at least two for good cross-pollination. Fla. 87-7 produced abundant pollen of high viability. The four clones Fla. 86-7, Fla. 86-9, Fla. 87-4, and Fla. 79-3 were effectively sterile from the standpoint of pollen production and germination. These clones should not be used in plantings as pollinizers.

Synchronization of flowering among clones must be checked in individual environments before effective cross pollination can be predicted. Further cross fertility studies are essential in determining commercial combinations and planting ratios.

Literature Cited


EVALUATION OF LOW-CHILL, NON-MELTING FLESH PEACHES
FOR FRESH MARKET POTENTIAL

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Additional index words. Prunus persica, shelf life, fruit breeding, dormancy, fruit firmness.

Abstract. Low chill clones of non-melting flesh peaches [P. persica (L.) Batsch] from the University of Florida breeding program were evaluated at Gainesville, Florida in 1992 for fruit and tree characteristics. Information is provided on chilling requirement, ripe date, blind nodes, fruit development period (FDP), crop load, fruit weight, shape and blush, flesh browning, and Brix. There was clonal variation for chilling requirement from 150 to 450 chill units and for FDP from 73 to 117 days. The earliest ripening clones (Fla. 91-8C and Oro A) ripened on May 4 and the latest clone (Fla. 88-26C) on June 17. Soluble solids (brix) varied among clones from 9% to 15%. The percentage of blind nodes among clones varied exten-

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