Causes and Control of Diplodia Stem-end Rot and Other Fruit Decays

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The Importance of Satisfied Markets

• Claims or rejected loads at destination markets are EXTREMELY COSTLY!
The Need

• Control of fruit decay is always a top concern
• Many factors influence the potential for decay development:
  – Preharvest field conditions and tree health
  – Harvesting & handling practices
  – Postharvest temperatures, relative humidity, exposure to ethylene, etc.

Diplodia stem-end rot
Control Options

• Preharvest – Looking for a reliable replacement for Benlate or Topsin
  – However, copper, Aliette, and phosphorous acid products to reduce Brown rot
Preharvest Materials Tested

- **Benlate** (Benomyl) – 2 lb/acre
- **Topsin M** (Thiophanate-methyl) – 2 lb/acre
- **Topsin F** (Thiophanate-methyl) – 16 oz/acre (liquid)
- **Headline** (Pyraclostrobin) – 16 oz/acre
- **Kocide DF** (Copper) – 4 lb/acre
- **Abound** (Azoxystrobin) – 16 oz/acre
- **Enable** (Fenbuconazole) – 8 oz/acre
- **Aliette** (Fosetyl-Al) – 5 lb/acre
Preharvest Materials Tested

- **Phosphorous acid** (Nutriphite or Phostrol) – 4 pints/acre
- **Pristine** (Pyraclostrobin + Boscalid) - 18.5 oz/acre
- **Actigard** (Acibenzolar-S-methyl) – 100ppm + 0.025% Silwet
- **Scholar** (Fludioxonil) – 8oz/acre
- **Switch** (cyprodinil & fludioxonil) – 14 oz./A
- **Bravo** (chlorothalonil) – 6 pts./A
- **OxiDate or HDH Peroxy** (H₂O₂) – 1%  
- **PAA** (15%) – 85 ppm
## Percent Total Decay

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58 d</td>
<td>34 d</td>
<td>78 d</td>
<td>77 d</td>
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<tr>
<td>Control</td>
<td>42.5 a w</td>
<td>48.2</td>
<td>79.9</td>
<td>18.8 a</td>
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<td>Ferbam</td>
<td>43.7 a</td>
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<tr>
<td>Acibenzolar-S-Methyl</td>
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<td>65.5</td>
<td>78.8</td>
<td>16.2 a</td>
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<td>Fenbuconazole</td>
<td>51.6 a</td>
<td>50.6</td>
<td>76.2</td>
<td>18.7 a</td>
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<tr>
<td>Fosetyl AL</td>
<td>59.9 a</td>
<td>50.2</td>
<td>77.6</td>
<td>16.4 a</td>
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<tr>
<td>Phosphorous acid</td>
<td>29.3 ab</td>
<td>44.7</td>
<td>84.8</td>
<td>20.9 a</td>
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<tr>
<td>Copper hydroxide</td>
<td>39.6 ab</td>
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<td>13.3 a</td>
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<tr>
<td>Azoxystrobin</td>
<td>---</td>
<td>39.7</td>
<td>70.2</td>
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<tr>
<td><strong>Benomyl</strong></td>
<td><strong>6.2 b</strong></td>
<td><strong>40.1</strong></td>
<td><strong>74.0</strong></td>
<td><strong>3.0 b</strong></td>
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<tr>
<td>Significance</td>
<td>*v</td>
<td>NS</td>
<td>NS</td>
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</tr>
</tbody>
</table>

*Significance: v = 0.05, * = 0.01, ** = 0.001, *** = 0.0001*
### Percent Total Decay

<table>
<thead>
<tr>
<th>Compound</th>
<th>'Sunburst'</th>
<th></th>
<th>'Marsh'</th>
<th></th>
<th>'Valencia'</th>
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<tbody>
<tr>
<td></td>
<td>18 Dec.</td>
<td></td>
<td></td>
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<tr>
<td>Control</td>
<td>60.0</td>
<td>71.8 a</td>
<td>41.7 a</td>
<td>31.8 a</td>
<td>30.5</td>
<td>60.2 a</td>
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<tr>
<td>Pyraclostrobin</td>
<td>51.8</td>
<td>50.8 b</td>
<td>36.5 ab</td>
<td>17.7 ab</td>
<td>28.3</td>
<td>48.2 a</td>
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<tr>
<td>Phosphorous acid</td>
<td>46.4</td>
<td>45.9 b</td>
<td>29.1 ab</td>
<td>16.7 ab</td>
<td>29.9</td>
<td>47.2 a</td>
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<tr>
<td>Thiophanate methyl</td>
<td>45.1</td>
<td>47.2 b</td>
<td>14.1 c</td>
<td>6.1 b</td>
<td>17.2</td>
<td>15.0 b</td>
</tr>
<tr>
<td>Benomyl</td>
<td>42.4</td>
<td>41.3 b</td>
<td>22.5 bc</td>
<td>14.2 ab</td>
<td>12.3</td>
<td>14.0 b</td>
</tr>
<tr>
<td>Significance</td>
<td>NS w</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>NS</td>
<td>**</td>
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</tbody>
</table>
**Summary of Experiments**

Preharvest application of different chemicals on tangerines, oranges, and grapefruits from 1999 to 2005 was evaluated. The table below shows the number of trials in which each treatment resulted in significantly more healthy fruit compared to the control in at least one of the two harvests.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Tangerine</th>
<th>Orange</th>
<th>Grapefruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benomyl</td>
<td>4²/6⁴</td>
<td>1/2</td>
<td>5/6</td>
</tr>
<tr>
<td>Thiophanate-methyl (WSB)</td>
<td>2/3</td>
<td>1/2</td>
<td>3/5</td>
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<tr>
<td>Thiophanate-methyl (FL)</td>
<td>1/1</td>
<td></td>
<td>1/1</td>
</tr>
<tr>
<td>Pyraclostrobin</td>
<td>1/1</td>
<td>0/1</td>
<td>1/3</td>
</tr>
<tr>
<td>Phosphorus Acid</td>
<td>1/4</td>
<td>0/1</td>
<td>0/4</td>
</tr>
<tr>
<td>Pyraclostrobin + Boscalid</td>
<td>0/2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper hydroxide</td>
<td>0/3</td>
<td>0/1</td>
<td></td>
</tr>
<tr>
<td>Azoxystrobin</td>
<td>0/2</td>
<td>0/2</td>
<td></td>
</tr>
<tr>
<td>Fenbuconazole</td>
<td>0/3</td>
<td>0/1</td>
<td></td>
</tr>
<tr>
<td>Fosetyl AL</td>
<td>0/3</td>
<td>0/1</td>
<td></td>
</tr>
<tr>
<td>Acibenzolar-S-methyl</td>
<td>0/2</td>
<td>0/1</td>
<td></td>
</tr>
</tbody>
</table>

²Number of trials the treatment resulted in significantly \((p < 0.05)\) more healthy fruit than the control in at least one of the two harvests.

⁴Total number of trials the material was tested.
Treatments:
Control = Water
Thy = Thymeguard (Thyme oil)
Men = Mentor EC (Propiconazole)
Qua = Quadris Top (Azoxystrobin + Difenconazole)
Hea = Headline (Pyraclostrobin)
Mer = Mertect 340F (Thiabendazole)
Gra = Graduate A+ (Azoxystrobin + Fludioxonil)
Top = Topsin (thiophanate-methyl)
2020-21 Preharvest Trials (all red grapefruit)

- CONTROL - WATER
- Topsin 4.5 FL*
  - thiophanate-methyl (45%)
- Graduate A+ *
  - fludioxonil (20.6%)
    + azoxystrobin (20.6%)
- Switch 62.5 WG
  - fludioxonil (25%)
    + cyprophostrobin (37.5%)
- Miravis Prime*
  - fludioxonil (21.4%)
    + pydiflumetofen (12.8%)
- Miravis Top
  - difenconazole (11.5%)
    + pydiflumetofen (6.9%)
- Headline
  - (Peraclostrobin) pyraclostrobin (23.6%)
- Thyme Guard (Thyme)
  - Thyme (23%)
- Citrus Fix*
  - 2, 4-D (45%)
- Quadris Top
  - azoxystrobin (18.2%)
    + difenoconazole (11.4%)

*not labeled preharvest for FL grapefruit
After harvest, fruit held:
5 days at 85F with 5 ppm ethylene
+ 3 weeks at 75F
After harvest, fruit held:
5 days at 85F with 5 ppm ethylene
+ 3 weeks at 75F
Conclusions

• Graduate A+
  – Fludioxonil (20.6%) + azoxystrobin (20.6%)
  – In all six field trials fludioxonil (20.6%) + azoxystrobin (20.6%) reduced postharvest SER similar to Topsin

• Mertect (TBZ)
  – Gave similar results as Graduate A+ the first year, but was dropped from further evaluation to prevent TBZ resistance from developing from both pre- and postharvest use

• Headline and Miravis Prime
  – Occasionally reduced postharvest SER
Thank You!

• For more information, visit the UF Postharvest Website
  ritenour@ufl.edu
  http://irrec.ifas.ufl.edu/postharvest/

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