4-25-2019

2019 Pesticide Safety - Fungus and Fruit Rot

Erika Saalau Rojas

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How does disease occur?
How does disease occur?
How does disease occur?
How does disease occur?
Susceptible host

Environmental conditions
Susceptible host or tissue

• Susceptible tissue is more important than variety.
• Determines timing for protection.
Susceptible host/tissue

Pathogen

Environmental conditions

Susceptible host/tissue
Susceptible host/tissue
Pathogen
Environmental conditions
Susceptible host/tissue
Field Rot | Storage Rot 3wks | Storage Rot 6wks | Healthy Berries
---|---|---|---
Aureobasidium | Coleophoma | Colletotrichum sp. | Phomopsis | Phyllosticta sp. | Physalospora
New Leaves (1YR) | Old Leaves (2YR)

Graph showing the percentage of each fungal species in different rot scenarios.
Where are the pathogens hiding?

- **Wind**: Phylllosticta elongata, Colletotrichum acutatum

- **Current-year leaves**
  - Phylllosticta vaccinii
  - Phylllosticta elongata
  - Physalospora vaccinii

- **Flowers**
  - Fusicoecum putrefaciens

- **Green fruit**
  - Phylllosticta vaccinii

- **Stems**
  - Colletotrichum gloeosporioides

- **1- and 2-year leaves**
  - Phylllosticta vaccinii
  - Phylllosticta elongata
  - Physalospora vaccinii
  - Fusicoecum putrefaciens

- **Sound, red fruit**
  - Physalospora vaccinii
  - Phylllosticta elongata
  - Coleophoma empetri

- **Current-year pedicel**
  - Fusicoecum putrefaciens
  - Phomopsis vaccinii

- **Rotten fruit**
  - Physalospora vaccinii
  - Coleophoma empetri

- **1-year pedicel**
  - Fusicoecum putrefaciens
  - Phomopsis vaccinii

- **Duff--leaves**
  - Phylllosticta vaccinii
  - Coleophoma empetri
  - Colletotrichum gloeosporioides

- **Duff--fruit**
  - Coleophoma empetri

- **Water**: Phylllosticta elongata, Coleophoma empetri, Colletotrichum acutatum
Where are the pathogens hiding?

• Sources of infection (pathogen survival)
  • Can I spray a fungicide early to ‘kill’ fungi?

• Cultural Practices
  • Bed age
Timing of applications
Timing of Applications

• There’s no such thing as a ‘normal’ year!
• Calendar-based applications versus bloom
• Bloom progression affected by:
  • Variety
  • Weather & Microclimate (young versus old bed)
  • Management? (late water?, sanding)
Which fungicide program works for you?

• Varieties

• Cultural management

• Product restrictions & economics

• Disease pressure

• Chemigation system
# Fungicides Available

<table>
<thead>
<tr>
<th>DMI</th>
<th>chloronitriles</th>
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<tbody>
<tr>
<td>FRAC Code 3</td>
<td>FRAC Code M5</td>
</tr>
<tr>
<td>Indar</td>
<td>Bravo (and many others)</td>
</tr>
<tr>
<td>Proline</td>
<td></td>
</tr>
<tr>
<td>Quadris Top</td>
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<table>
<thead>
<tr>
<th>QoI</th>
<th>dithiocarbamates</th>
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<tbody>
<tr>
<td>FRAC Code 11</td>
<td>FRAC Code M3</td>
</tr>
<tr>
<td>Abound</td>
<td>Mancozeb</td>
</tr>
<tr>
<td>Quadris Top</td>
<td>Ferbam</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>polyoxins</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>FRAC Code 19</td>
<td></td>
</tr>
<tr>
<td>Oso</td>
<td></td>
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Each box represents one mode of action.
## Fungicide Resistance Risk

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<td>Mancozeb</td>
</tr>
<tr>
<td>FRAC Code 11</td>
<td>Ferbam</td>
</tr>
<tr>
<td>Abound</td>
<td>High risk</td>
</tr>
<tr>
<td>Quadris Top</td>
<td>Medium risk</td>
</tr>
<tr>
<td>polyoxins</td>
<td>Low risk</td>
</tr>
<tr>
<td>FRAC Code 19</td>
<td></td>
</tr>
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<td>Oso</td>
<td></td>
</tr>
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</table>
Quadris Top Label

Active Ingredients:
- Azoxyostrobin* .......... 18.2%
- Difenoconazole** .......... 11.4%

Other Ingredients: 70.4%
Total: 100.0%

Crop | Target Diseases | Use Rate fl oz product/A | Remarks
--- | --- | --- | ---
Cranberry | Bitter rot (Colletotrichum gloeosporioides) | 10 – 14* | For best activity, apply Quadris Top Fungicide prior to or early in the disease development. An adjuvant may be added at specified rates. Apply on a 7-14 day interval.
| Blotch rot (Physalospora vacciniae) | | | Do not apply more than two sequential applications before alternating to a fungicide with a different mode of action.
| Cottonball (Monilinia oaxacj) | | | 
| Fruit Rot (Physalospora vacciniae) | (Gloeosporium cingulata) (Coleophoma empetri) | | 
| Leaf Rust (Pucciniastrum vaccini) | Lophodermium Twig Blight (Lophodermium spp.) | | 
| Ripe rot (Coleophoma empetri) | | | 

14 fl oz product/A contains 0.082-0.115 lb difenoconazole/A and 0.131-0.183 lb azoxyostrobin/A.

Application: For best results, sufficient water volume must be used to provide thorough coverage. Quadris Top Fungicide can be applied by ground, chemigation, or aerial application. For aerial applications, apply in a minimum of 5 gal/A of water. Chemigation with excessive water may lead to a decrease in efficacy. Applicators should use care in making applications near non-target aquatic habitats.

Specific Use Restrictions:
- Do not apply more than 42 fl oz/A/year of Quadris Top Fungicide.
- Do not apply more than 0.34 lb ai/A/year of difenoconazole-containing products.
- Do not apply more than 1.5 lb ai/A/year of azoxyostrobin-containing products.
- Do not allow release of irrigation or flood water to non-target aquatic habitat for at least 14 days after the last application.
- Do not apply when weather conditions favor drift from treated areas to non-target aquatic habitat.
- Do not treat fields used for aquaculture of fish or crustacean.
- Do not drain water from treated fields into ponds used for aquaculture of fish or crustacean.

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5. Do not treat fields used for aquaculture of fish or crustacean.
6. Do not drain water from treated fields into ponds used for aquaculture of fish or crustacean.

*CAS No. 131860-33-8
**NOM No. 110146-38-3
Quadris Top Label

*10-14 fl oz product/A contains 0.082-0.115 lb difenoconazole/A and 0.131-0.183 lb azoxystrobin/A.

Application: For best results, sufficient water volume must be used to provide thorough coverage. Quadris Top Fungicide can be applied by ground, chemigation, or aerial application. For aerial applications, apply in a minimum of 5 gal/A of water. For chemigation, apply in 0.1-0.25 inches/A of water. Chemigation with excessive water may lead to a decrease in efficacy. Applicators should use care in making applications near non-target aquatic habitats.

Specific Use Restrictions:
1) Do not apply more than 42 fl oz/A/year of Quadris Top Fungicide.
2) Do not apply more than 0.34 lb ai/A/year of difenoconazole-containing products.
3) Do not apply more than 1.5 lb ai/A/year of azoxystrobin-containing products.
4) Do not apply in or near irrigation outlets. Retreat streams, wetlands, or aquatic habitat for at least 14 days after the last application.
### Standard Approach

<table>
<thead>
<tr>
<th>In bloom</th>
<th>In bloom</th>
<th>Out of bloom 1</th>
<th>Out of bloom 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indar/Abound</td>
<td>Indar/Abound</td>
<td>Bravo</td>
<td>Bravo</td>
</tr>
<tr>
<td>Proline</td>
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This is the preferred regime for areas with moderate to high fruit rot. Some yield reductions are experienced with Bravo due to slight phytotoxicity.

The number of out-of-bloom applications depends on the cultivar. Early Black, Howes and Mullica Queen are more resistant and generally require fewer applications.
Only two applications?
Protect most open flowers and pinheads.
Should I add another spray?
Should I add another spray?
Scenario 2

- Product restrictions (no Bravo)

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</tr>
</thead>
<tbody>
<tr>
<td>Indar/Abound</td>
<td>Indar/Abound</td>
<td>Manzate</td>
<td>Manzate</td>
</tr>
<tr>
<td>Indar/Abound</td>
<td>Indar/Abound</td>
<td>Manzate</td>
<td></td>
</tr>
</tbody>
</table>
Scenario 2 a

- Concerned about color

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<th>Out of bloom 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indar/Abound</td>
<td>Manzate</td>
<td>Indar/Abound</td>
<td>???</td>
</tr>
</tbody>
</table>
Scenario 3

• Fast bloom progression

<table>
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<td>Bravo</td>
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<td>Bravo</td>
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Discussion & Questions