Key Vineyard Pests and How to Handle Them

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MSU Extension, Berrien County
Why we have to do pest management
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Fungi and Diseases

- Powdery Mildew
- Downy Mildew
- Black Rot
- Phomopsis
- Botrytis
Fungi and Diseases

- Sour Rots
- Anthracnose
- Esca
- Leafroll Virus
- Tobacco Ringspot Virus
- Tomato Ringspot Virus
Inoculum


Primary Inoculum: The way the infection gets started on the plant in a given year.

Secondary Inoculum: The way the infection spreads.
Powdery Mildew

- Looks like a white powder on the top of the leaf
Powdery Mildew

- Powdery only at first
- Eventual discoloring, berry cracking
Powdery Mildew

• Most important time to cover fruit:
  – Pre-bloom, until
  – 2-4 wks later
    • depending on var.

• Cover leaves afterwards:
  – For fruit development, esp. in *vinifera*

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<th>Temperature</th>
<th>Generation time</th>
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<tr>
<td>86</td>
<td>6</td>
</tr>
<tr>
<td>90</td>
<td>(too hot)</td>
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</tbody>
</table>
Downy Mildew

• On leaves:
  – Orange/brown oil spots on top side
  – White, “downy” areas on underside of leaf
Downy Mildew

- On fruit:
  - White downy sporulation on berry
Downy Mildew

- Overwinters on leaves / soil surface
- Primary infections:
  - 2-3 weeks before bloom
  - Rain splash required for infection: saturated soil surface
Black Rot

• On leaves:
  – Light brown, roughly circular spots
  – Ring of fruiting bodies as they mature: *secondary inoculum*
Black Rot

• On fruit:
  – Starts as small whitish spot
  – Brown spot expands outwards.
  – Berries shrivel to mummies: *primary inoculum*

• Also forms shoot lesions.
Black Rot

- Berries susceptible from beginning of bloom until 3-5 weeks later
- Coverage essential at this time.
Phomopsis

• On leaves:
  – Puckered, brown spots usually with yellow surrounding

• On shoots:
  – Lesions: *primary*
Phomopsis

- On fruit:
  - Usually rachis is infected
  - Berries go brown and shrivel
Phomopsis

• **Timing:**
  - Most important time to cover is in the first few inches of shoot growth!

• **Vulnerability:**
  - Many varieties don’t have a problem with Phomopsis –
  - Mostly in **American** grapes (Concord, Niagara, Norton, etc), and certain Hybrids
Sour Rot

- Smells and tastes of vinegar
- Usually fruit flies present
- No visible sporulation
- Very difficult to treat with fungicides
Botrytis Fruit Rot

• On fruit only
• Primary inoculum is ubiquitous
• Infection occurs late
• Ants instead of fruit flies.
• Does not smell of vinegar
• Fuzzy sporulation
Botrytis Fruit Rot

- Two kinds of infection:
  - Latent infections form during / after bloom
  - Lie in wait until veraison!
  - Use at least 1 Botrytis material around bloom for vuln. var.

- Veraison infections
- Form anytime from bunch closure to harvest
- Why we treat at bunch closure
- Rain required!
Risk Factors: Botrytis and Sour

• Risk factors:
  – tight-clustered varieties
  – wet clusters after veraison
  – thick canopy
  – wounds: birds, insects, powdery mildew
  – excessive Nitrogen
Disease Control

• Cultural control
  • *Do no over-fertilize with Nitrogen.*
  • *Cut out excess shoot growth:*
    • *Dappled light throughout the canopy*
  • *Leaf removal around fruit.*
  • *Keep under-vine vegetation trimmed back.*
Disease Control

• Fungicides

• Protectant vs. Systemic
Types of Fungicides

• Protectants
  • On surface of plant - kill fungal spores as they germinate, therefore:
    • Preventative only
  • Kill by poisoning several sites in fungus, therefore:
    • Less likely for resistance to develop
Types of Fungicides

• Systemics
  • Absorbed into plant and kill fungus as it penetrates the plant.
  • Generally a single-mode poison:
    • resistance more likely
Phostrol®
Agricultural Fungicide

ACTIVE INGREDIENTS:
Mono- and dibasic sodium, potassium,
and ammonium phosphites* ........................................ 53.6%
OTHER INGREDIENTS: .................................................. 46.4%
TOTAL: ................................................................. 100.0%

* Contains 6.27 lb/gallon of the active ingredients mono- and dibasic sodium, potassium,
and ammonium salts of phosphorus acid. Equivalent to 4.17 lb/gallon of phosphorus
acid or 35.6 % by weight.

KEEP OUT OF REACH OF CHILDREN
CAUTION / PRECAUCIÓN
Si usted no entiende la etiqueta, busque a alguien para que se le explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)
SEE INSIDE BOOKLET FOR FIRST AID AND PRECAUTIONARY STATEMENTS

For Chemical Spill, Leak, Fire, or Exposure, Call CHEMTREC
(800) 424-9300
For Medical Emergencies Only,
Call (877) 325-1840

EPA REG. NO. 55146-83

Manufactured for
Nufarm Americas Inc. AGT Division
11901 S. Austin Avenue
Alsip, IL 60803
(800) 345-3330

Nufarm
Modes of Action

FRAC code:
Fungicide Resistance Action Committee

- FRAC code indicates how the fungicide works on the fungus
Protectant Fungicides

- **EBDC’s**
  - Manzate, Mancozeb, Penncozeb, Dithane, Koverall
  - Ziram, Thiram, Ferbam
  - Excellent on **Black Rot** and **Phomopsis**
  - Good on **Downy Mildew**

- **Captan**
  - Excellent on **Downy Mildew**, **Phomopsis**
  - Good on **Black Rot**
Protectant Fungicides

• Sulfur
  • Many products, some **OMRI** approved
  • Good on **Powdery Mildew**, unpleasant to work with

• Copper
  • Many products, some **OMRI** approved
  • Good on **Downy Mildew**
  • Overuse can pollute soil
Systemic Fungicides

- S.I. Fungicides (Group 3)
  - Rally, Procure, Tilt, Elite, Rhyme, etc.
  - “Magic bullet” -> Resistance
  - Good to Excellent on Powdery, Black Rot, and Phomopsis
  - Included in many pre-mixed materials.
  - Limit 3 app/yr
Systemic Fungicides

• Strobilurins (Group 11)
  • Abound, Flint, Sovran, etc.
  • *Good to Excellent* on everything except *Botrytis* – Black Rot, Downy Mildew, Powdery Mildew, Phomopsis
  • *Even higher* resistance risk
  • Limit to 2 apps/year – including pre-mixes
Systemic Fungicides

• Phosphonates (Group 33)
  • Phostrol, Aliette, Prophyt, etc.
  • Chemically similar to Phosphorous fertilizers
  • Lowest environmental risk
  • Excellent on Downy Mildew, some activity on Black Rot and Phomopsis.
Systemic Fungicides

- Systemic materials for Downy Mildew
  - Group 40 - Revus and Zampro
  - Group 4 – Ridomil products
    - The “Right Bower” of Downy management
    - Max 1 app/yr
  - Others – Tanos, Ranman, Reason, Presidio
Systemic Fungicides

• Systemic Materials for Powdery Mildew
  • Vivando
  • Torino
  • Topsin M
  • Quintec
Systemic Fungicides

• Systemic Materials for Botrytis Fruit Rot
  • Group 7 Materials
    • Endura, multiple pre-mixes
  • Group 9
    • Scala, Switch, and Vanguard
Pre-Mixed Materials

• Pristine
• Merivon
• Quadris Top
• Luna Experience
• Inspire Super

• Include two unrelated active ingredients,
• Usually mixed to work on all major diseases.
• Often expensive – use during bloom period.
Other Materials

• Salts – e.g. Nutrol, Prev-Am
• Oils – e.g. JMS Stylet Oil

• All of the above: excellent on **Powdery Mildew**, can knock back active infections
• Little to no activity on other diseases
• Oil sprays can cause plant injury in warm weather
Other Materials

• Biologicals
  • Serenade, Sonata, Double Nickel
    • Good protectants for most diseases
    • Use in rotation with chemicals.
    • Our only good options for Sour Rot.
  • Botector
    • Excellent on Botrytis.

• All of the above: OMRI
Modes of Action

FRAC code:
Fungicide Resistance Action Committee

- Rotate FRAC codes throughout the season!
- Especially with systemic fungicides
## Infection Risk (Michigan)

<table>
<thead>
<tr>
<th></th>
<th>1-3” shoot</th>
<th>5-8” shoot</th>
<th>10-16” shoot</th>
<th>pre-bloom</th>
<th>bunch closure</th>
<th>veraison</th>
<th>pre-harvest</th>
<th>post harvest</th>
</tr>
</thead>
</table>

| **Phomopsis**    |            |            |              |           |               |          |             |              |
|                  |            |            |              |           |               |          |             |              |

| **Black Rot**    |            |            |              |           |               |          |             |              |
|                  |            |            |              |           |               |          |             |              |

| **Powdery Mildew** |            |            |              |           |               |          |             |              |
|                   |            |            |              |           |               |          |             |              |

| **Downy Mildew** |            |            |              |           |               |          |             |              |
# Grape

## Pre-Bloom, Bloom, & Postbloom Sprays

<table>
<thead>
<tr>
<th>Product/Class</th>
<th>Black Rot</th>
<th>Downy</th>
<th>Powdery</th>
<th>Botrytis</th>
<th>Phomopsis</th>
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### Grape Pre-Bloom, Bloom, & Postbloom Sprays

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<td>+++</td>
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<tr>
<td>Product/Class</td>
<td>Black Rot</td>
<td>Downy</td>
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<td>+++</td>
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• There are more!
• Reference: Michigan Fruit Management Guide
Insect Pests

- Spring bud feeders:
  - Flea beetles
  - Climbing cutworm
Insect Pests

- Spring bud feeders:
  - Flea beetles
  - Climbing cutworm

- Leaf feeders:
  - Leafhoppers
  - Japanese Beetle
Insect Pests

- Spring bud feeders:
  - Flea beetles
  - Climbing cutworm

- Leaf feeders:
  - Leafhoppers
  - Japanese Beetle

- Grape Berry Moth

- Others: Phylloxera, Mealybug
Classes of Insecticides

• “Reduced-risk”
  • longer residual
  • ingestion poisons
  • specific
Classes of Insecticides

- “Reduced-risk”
  - Delegate, SpinTor, Entrust, etc.
  - Intrepid
  - Altacor
  - Agri-Mek & other Miticides
  - Oberon, Movento
Classes of Insecticides

• “Broad-Spectrum”
  • shorter residual
  • contact poisons
  • kill everything
Classes of Insecticides

- Broad-spectrum
  - Organophosphates: Lorsban, Imidan
  - Pyrethroids: Danitol, Mustang Max, Brigade, etc.
  - Lannate, Sevin

- In Between
  - Neonicotinoids. Systemic: get into the veins of the plant, poison the insects when they feed.
What is “reduced risk?”

- “Risk” refers to…
  - Applicator, consumer, and neighbor health risks
  - Non-target arthropods
    - Bees
    - Predatory insects
    - Predatory mites
    - Parasitoids
  - Groundwater pollution
Flea Beetle & Climbing Cutworm

• Feed from bud swell to 2-5 inch shoots
• Kill buds, rarely results in serious damage.
• Treatment: Sevin, or a Pyrethroid.

(S. Van Timmermen, MSU)
Leafhoppers

• Summer leaf feeding.
• Grape Leafhopper – bronzing, burnt leaves
• Potato Leafhopper – yellowing, slight curling
Leafhoppers

• Only occasionally worth treating
• Use a Neonicotinoid.
• Or a Pyrethroid like Baythroid or Brigade
Japanese Beetle and Rose Chafer

• Japanese Beetle: leaf feeding in late summer

• Rose Chafer: leaf feeding and bloom feeding in early summer
Japanese Beetle and Rose Chafer

- Sevin
- Imidan
- Neonicotinoids
- Pyrethroids
Grape Berry Moth
Grape Berry Moth
Grape Berry Moth

- #1 Grape pest in the Eastern US.
- 3 Generations per year.
- Feed inside berry.
- Most of their life cycle – can’t reach them with insecticides!
- So: timing of application

(Rufus Isaacs, MSU)
Grape Berry Moth

Contact Poisons

- Imidan
- Sevin
- Pyrethroids: Danitol, Hero, Gladiator, Mustang Maxx, Leverage, Baythroid, Brigade

Ingestion Poisons

- *Intrepid*
- *Altacor*
- Delegate, Entrust, SpinTor
- BT Toxin
Grape Berry Moth: Spray Timing

- **Broad spectrum contact poisons:**
  - Sevin
  - Imidan
  - Danitol

  **SHORT residual,** spray on larvae directly

- **Reduced risk ingestion poisons:**
  - Entrust
  - Altacor
  - Belt
  - Intrepid
  - Dipel

  **LONG residual,** spray on leaf surface **BEFORE** larvae hatch

# of larvae on fruit

810 GDD  910 GDD
Grape Berry Moth: Spray Timing

- Ingestion Poisons *at the start of egg-laying*
- Contact Poisons *about 4 days later*.
- Dates vary year-to-year and region-to-region
Grape Berry Moth: Spray Timing

• In Southwest Michigan, egg-laying happens...
• 1\textsuperscript{st} generation: at wild grape bloom
  • Usually last week of May
• 2\textsuperscript{nd} generation: 810 GDD47 later
  • Usually the first week of July
• 3\textsuperscript{rd} generation: 810 GDD47 later
  • Usually the first week of August
Grape Berry Moth: Spray Timing

- Enviroweather.msu.edu

- **Grape Berry Moth model**
- Spray timing recommendations for your region
- Uses date of *wild grape bloom*. So pay attention to when this occurs.
- for most of the MI, end of May or first half of June
Grape Mealybug

• Newer pest in Michigan
• Spreads a virus that impacts fruit production.
• Find out whether neighbors have it! Prepare to treat if necessary: Movento.