Key Vineyard Pests and How to Handle Them

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Why we have to do pest management

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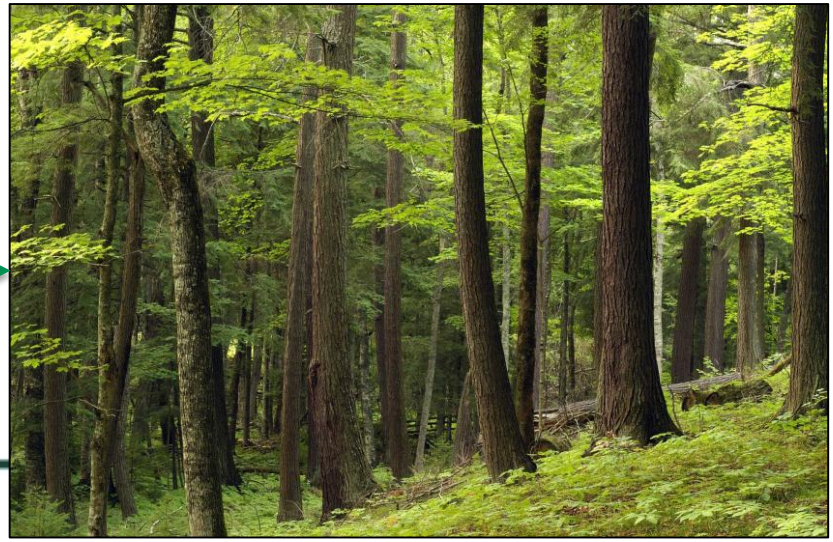


Fungi and Diseases

- **Powdery Mildew**
- **Downy Mildew**
- **Black Rot**

- **Phomopsis**

- **Botrytis**

Fungi and Diseases

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

Inoculum

Inoculum: Source of the fungus. Usually spores.

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

Secondary Inoculum: The way the infection spreads.

Powdery Mildew

- On leaves
  - Looks like a white powder on the top of the leaf

Powdery Mildew

- On fruit:
  - 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*

Temperature	Generation time
44	32
48	25
52	16
54	18
59	11
63	7
74	6
79	5
86	6
90	(too hot)

Downy Mildew

- On leaves:
  - Orange/brown oil spots on top side
  - White, "downy" areas on underside of leaf

Downy Mildew

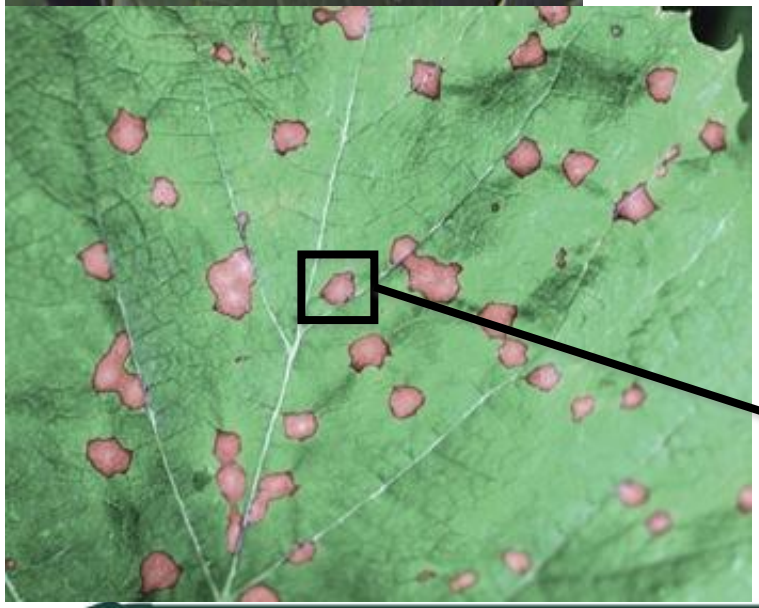
- On fruit:
  - White downy sporulation on berry

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

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*

GROUP 33 FUNGICIDE

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 la 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

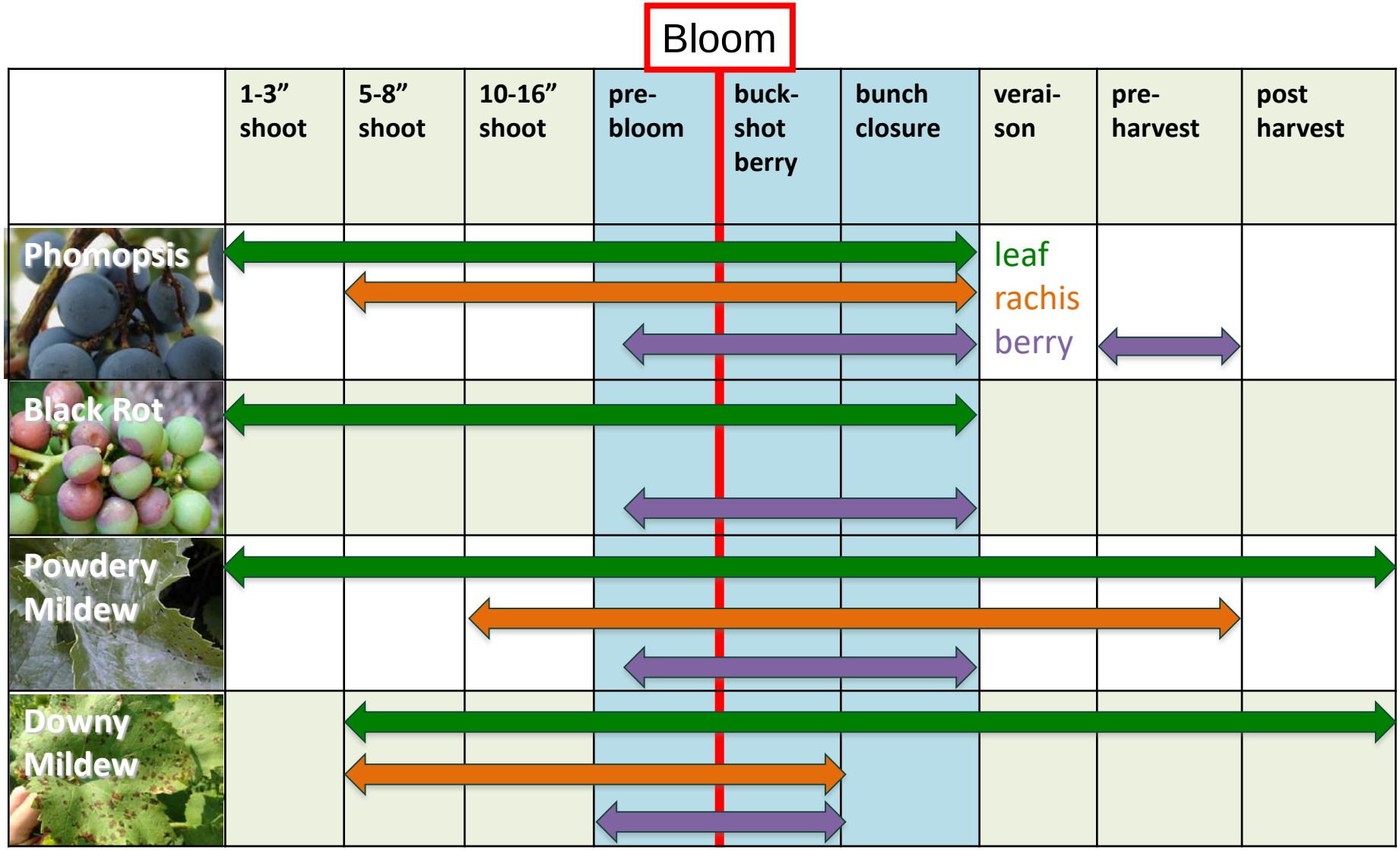
- Biologicals
  - Serenade, Sonata, Double Nickel
    - Good protectants for most diseases
    - Use in rotation with chemicals.
    - Our only good options for **Sour Rot.**
  - Botector
    - Excellent on **Botrytis.**
  - All of the above: **OMRI**

Modes of Action

FRAC code:
Fungicide Resistance Action Committee

- Rotate FRAC codes throughout the season!
- Especially with systemic fungicides

Infection Risk (Michigan)



Pre-Bloom, Bloom, & Postbloom Sprays

Product/Class	Black Rot	Downy	Powdery	Botrytis	Phomopsis
EBDCs	+++	++	+	0	+++
Ziram	++	++	++	+	++
Captan (wg)	++	+++	0	+	+++
Rally	+++	0	+++	0	++
Elite	+++	0	+++	0	++
Abound	+++	+++	++	+	+++
Sovran	+++	++	+++	+	+++
Flint	+++	++	+++	++	+++
Serenade	++	++	++	++	++
Sonata	++	++	++	++	++
Sulfur	0	0	++	0	0
Copper	+	+++	++	+	+

Grape

MICHIGAN STATE UNIVERSITY | Extension

Pre-Bloom, Bloom, & Postbloom Sprays

Product/Class	Black Rot	Downy	Powdery	Botrytis	Phomopsis
Phosphonates	++	+++	+	?	++
Ridomil MZ	++	+++	0	0	++
Ridomil Copper	+	+++	++	+	+
Revus	++	+++	++	0	++
Revus Top	+++	+++	+++	0	++
Inspire Super	+++	0	+++	+++	++
Quadris Top	+++	+++	+++	+	++
Pristine	+++	+++	+++	++	+++
Merivon	+++	+++	+++	++	+++
Luna Experience	+++	?	+++	+++	+++
Vivando	++	++	+++	?	?
Quintec	++	?	+++	?	?
Torino	++	?	+++	?	+

Pre-Bloom, Bloom, & Postbloom Sprays

Product/Class	Black Rot	Downy	Powdery	Botrytis	Phomopsis
Elevate	0	0	+	+++	0
Scala	+	?	++	+++	++
Vangard	?	?	+	+++	?
Switch	?	0	?	+++	?

- There are more!
- Reference: Michigan Fruit Management Guide

Insect Pests

- Spring bud feeders:
  - Flea beetles
  - Climbing cutworm

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- Leaf feeders:
  - Leafhoppers
  - Japanese Beetle

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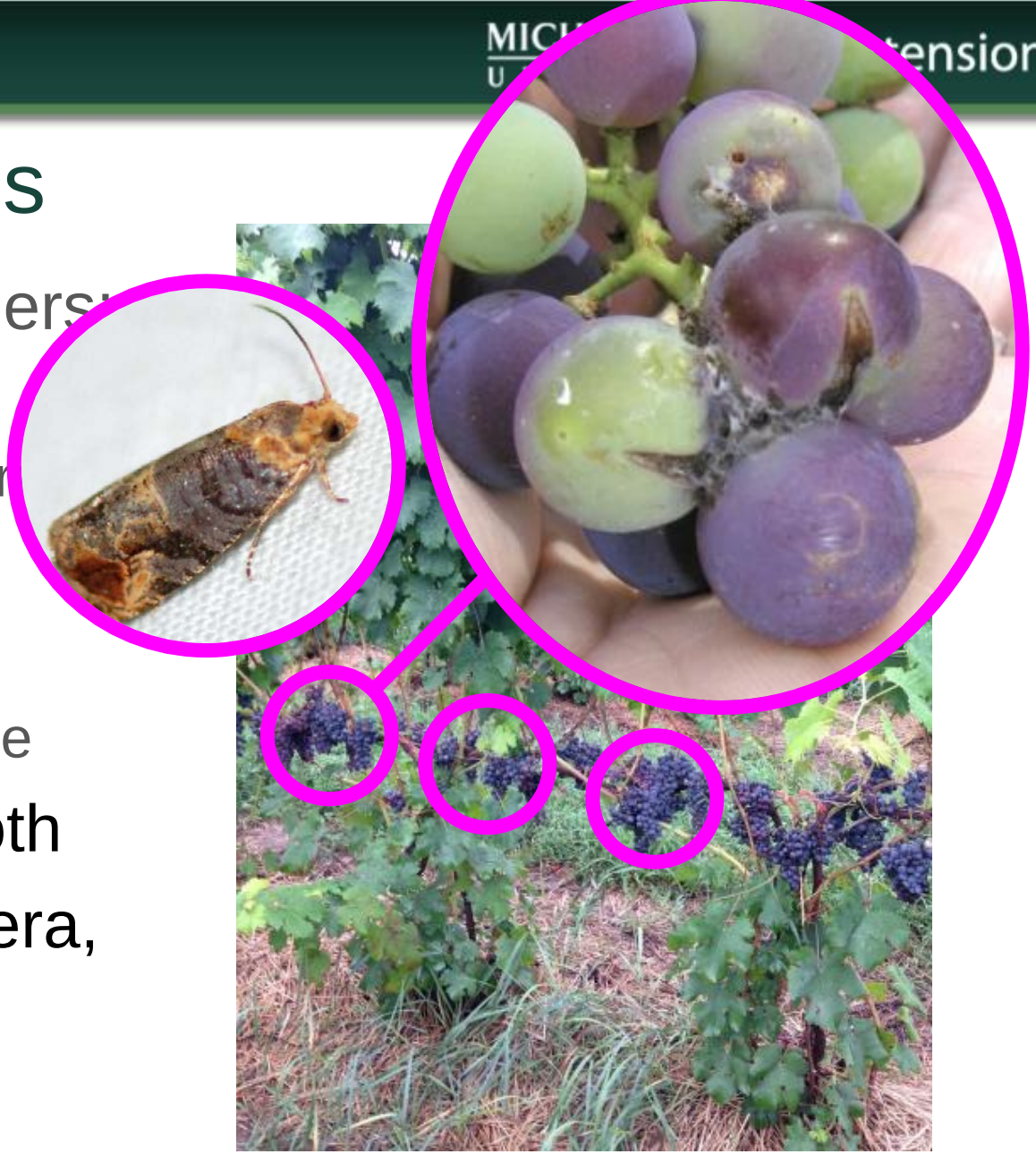
- Spring bud feeders:
  - Flea beetles
  - Climbing cutwor
- Leaf feeders:
  - Leafhoppers
  - Japanese Beetle
- Grape Berry Moth
- Others: Phylloxera, Mealybug



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.
- Treament: 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

- Treatment
  - 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

Grape Berry Moth

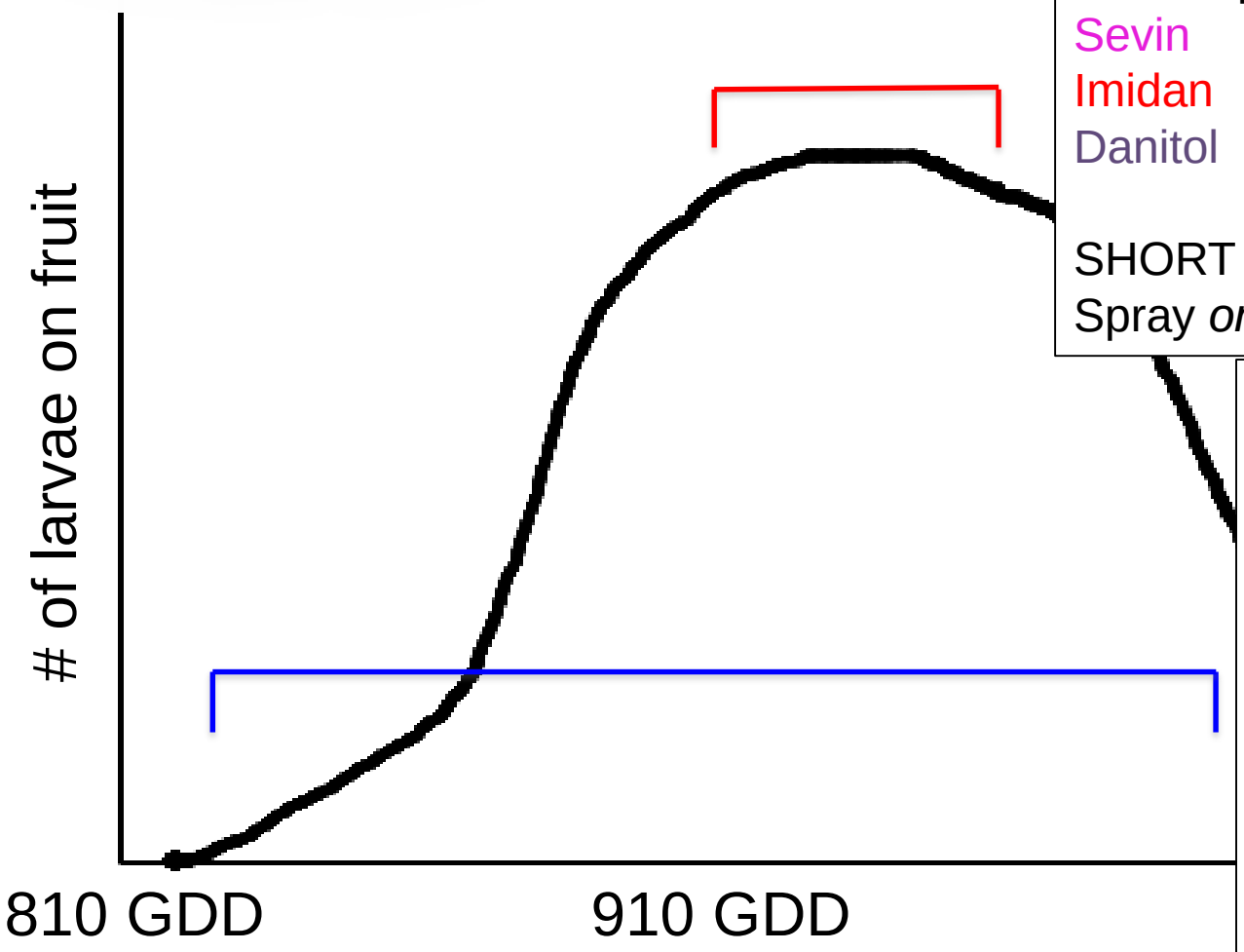
Contact Poisons

- 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

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...
- 1st generation: at wild grape bloom
  - Usually last week of May
- 2nd generation: 810 GDD47 later
  - Usually the first week of July
- 3rd 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.

Questions? Comments?