Grape Fruit Rots Diagnostics & Management

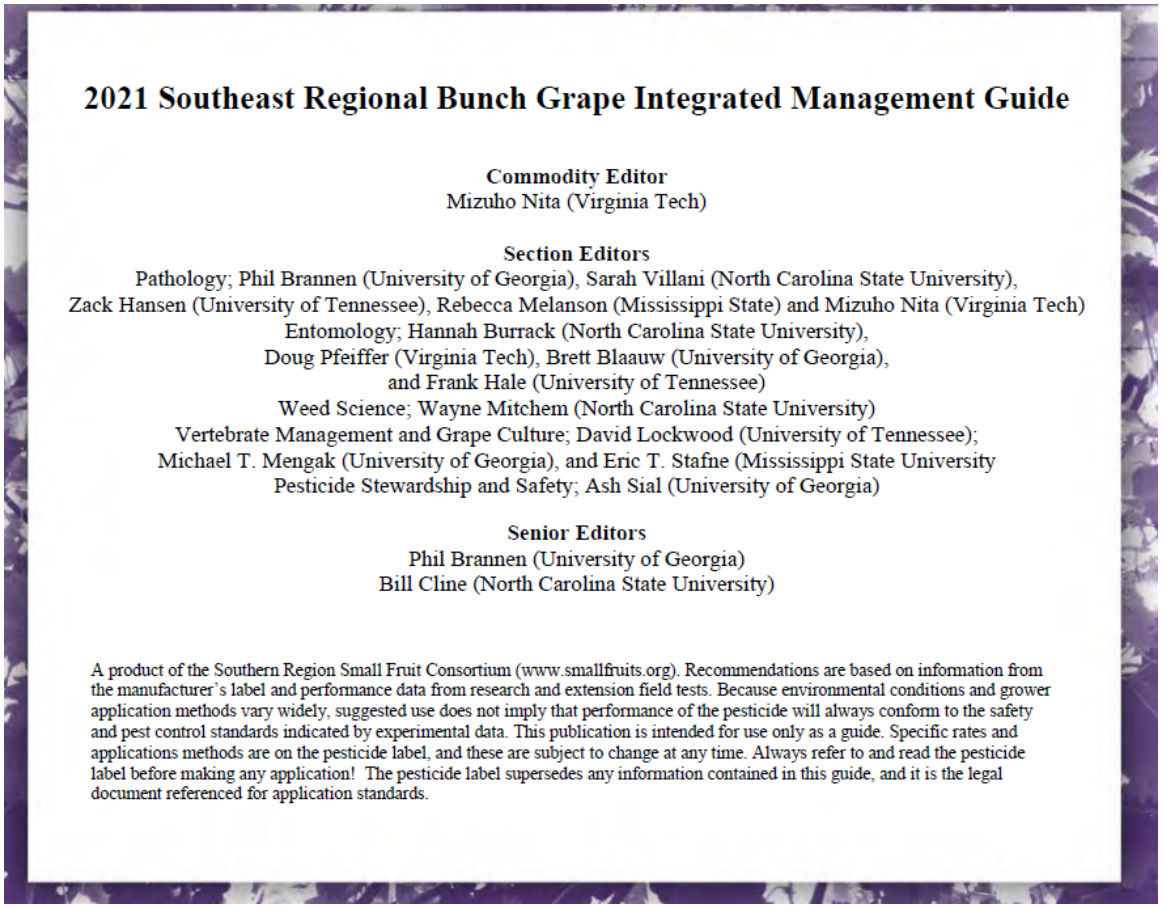
Zach Hansen
Assistant Professor / Extension Specialty Crops Pathologist
Department of Entomology and Plant Pathology
University of Tennessee Institute of Agriculture
February 18, 2022
zhansen1@utk.edu / office: 865-974-7784

Since 1963, the IR-4 Project (IR-4) has been the primary entity in the United States to **facilitate registrations of conventional pesticides and biopesticides on Specialty Food crops (fruits, vegetables, nuts, herbs, spices) and non-food Environmental Horticulture crops**.

Resources

www.smallfruits.org/ipm-production-guides/

Southeastern Regional Bunch Grape Integrated Management Guide



2021 Southeast Regional Bunch Grape Integrated Management Guide

Commodity Editor
Mizuho Nita (Virginia Tech)

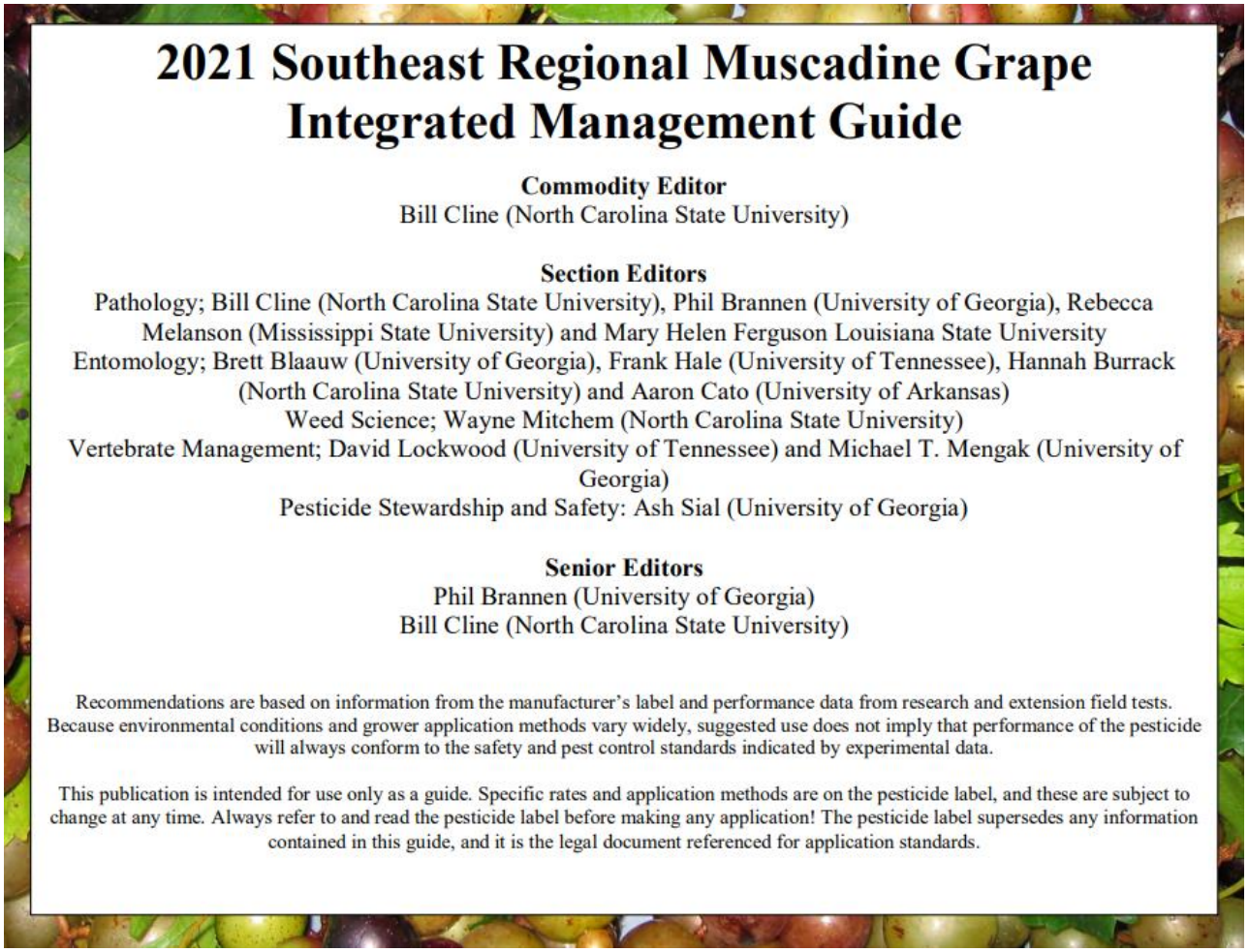
Section Editors
Pathology; Phil Brannen (University of Georgia), Sarah Villani (North Carolina State University),
Zack Hansen (University of Tennessee), Rebecca Melanson (Mississippi State) and Mizuho Nita (Virginia Tech)
Entomology; Hannah Burrack (North Carolina State University),
Doug Pfeiffer (Virginia Tech), Brett Blaauw (University of Georgia),
and Frank Hale (University of Tennessee)
Weed Science; Wayne Mitchem (North Carolina State University)
Vertebrate Management and Grape Culture; David Lockwood (University of Tennessee);
Michael T. Mengak (University of Georgia), and Eric T. Stafne (Mississippi State University
Pesticide Stewardship and Safety; Ash Sial (University of Georgia)

Senior Editors
Phil Brannen (University of Georgia)
Bill Cline (North Carolina State University)

A product of the Southern Region Small Fruit Consortium (www.smallfruits.org). Recommendations are based on information from the manufacturer's label and performance data from research and extension field tests. Because environmental conditions and grower application methods vary widely, suggested use does not imply that performance of the pesticide will always conform to the safety and pest control standards indicated by experimental data. This publication is intended for use only as a guide. Specific rates and applications methods are on the pesticide label, and these are subject to change at any time. Always refer to and read the pesticide label before making any application! The pesticide label supersedes any information contained in this guide, and it is the legal document referenced for application standards.

Free download:
www.smallfruits.org

Southeastern Regional Muscadine Grape Integrated Management Guide



2021 Southeast Regional Muscadine Grape Integrated Management Guide

Commodity Editor
Bill Cline (North Carolina State University)

Section Editors
Pathology; Bill Cline (North Carolina State University), Phil Brannen (University of Georgia), Rebecca Melanson (Mississippi State University) and Mary Helen Ferguson Louisiana State University
Entomology; Brett Blaauw (University of Georgia), Frank Hale (University of Tennessee), Hannah Burrack (North Carolina State University) and Aaron Cato (University of Arkansas)
Weed Science; Wayne Mitchem (North Carolina State University)
Vertebrate Management; David Lockwood (University of Tennessee) and Michael T. Mengak (University of Georgia)
Pesticide Stewardship and Safety: Ash Sial (University of Georgia)

Senior Editors
Phil Brannen (University of Georgia)
Bill Cline (North Carolina State University)

Recommendations are based on information from the manufacturer's label and performance data from research and extension field tests. Because environmental conditions and grower application methods vary widely, suggested use does not imply that performance of the pesticide will always conform to the safety and pest control standards indicated by experimental data.

This publication is intended for use only as a guide. Specific rates and application methods are on the pesticide label, and these are subject to change at any time. Always refer to and read the pesticide label before making any application! The pesticide label supersedes any information contained in this guide, and it is the legal document referenced for application standards.

Free download:
www.smallfruits.org

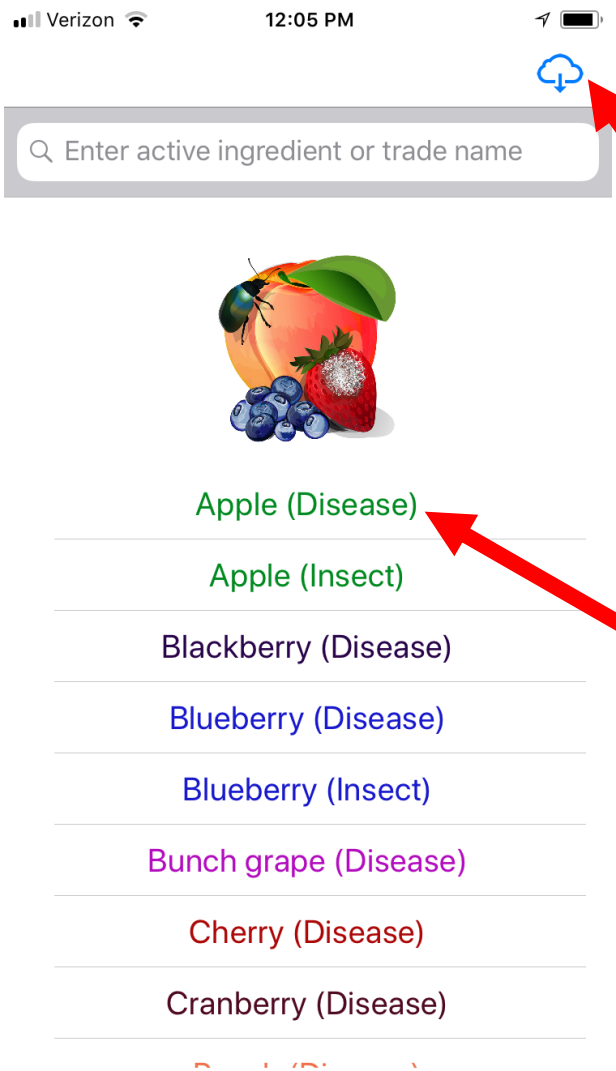
Resources for organic growers

- The Ohio State University Organic Small Fruit Disease Management Guidelines
  - https://u.osu.edu/fruitpathology/organic-small-fruit-disease-management-guidelines-2/
  - https://cdn.ymaws.com/www.mngrapes.org/resource/resmgr/Files/OSU-Organic-Grape-Diseases.pdf
- Cornell University Organic Production and IPM Guide for Grapes
  - https://ecommons.cornell.edu/bitstream/handle/1813/42888/2016-org-grapes-NYSIPM.pdf?sequence=4&isAllowed=y

“MyIPM” – free mobile app

- MyIPM – an app designed to help commercial growers make disease management decisions
- useful to help identify pests & diseases, especially on-the-go

“MyIPM” – free mobile app

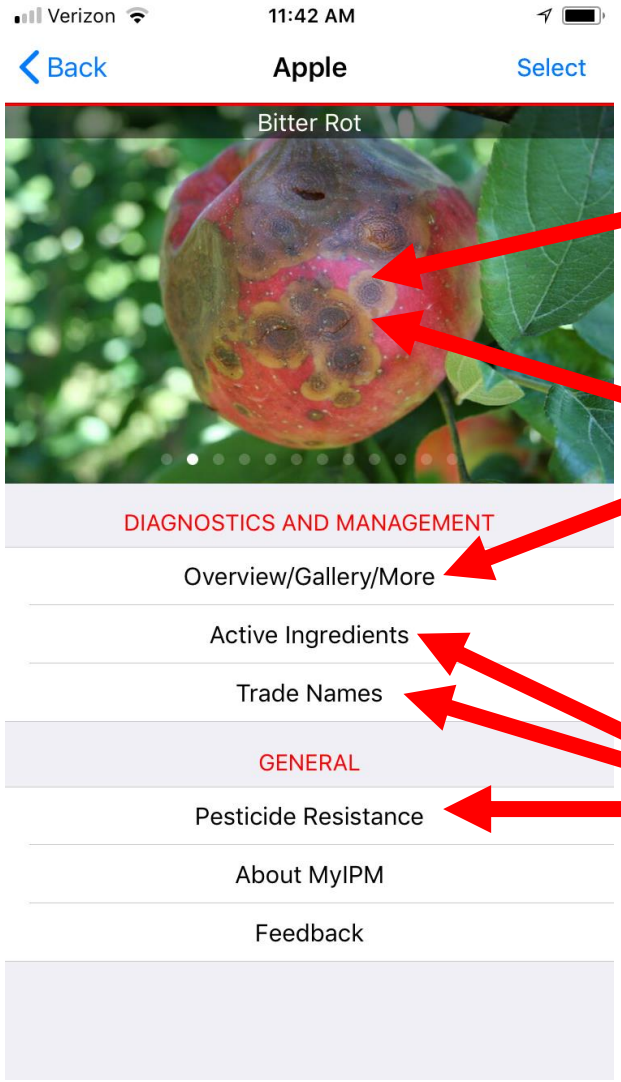


Select the Cloud icon to choose content to download

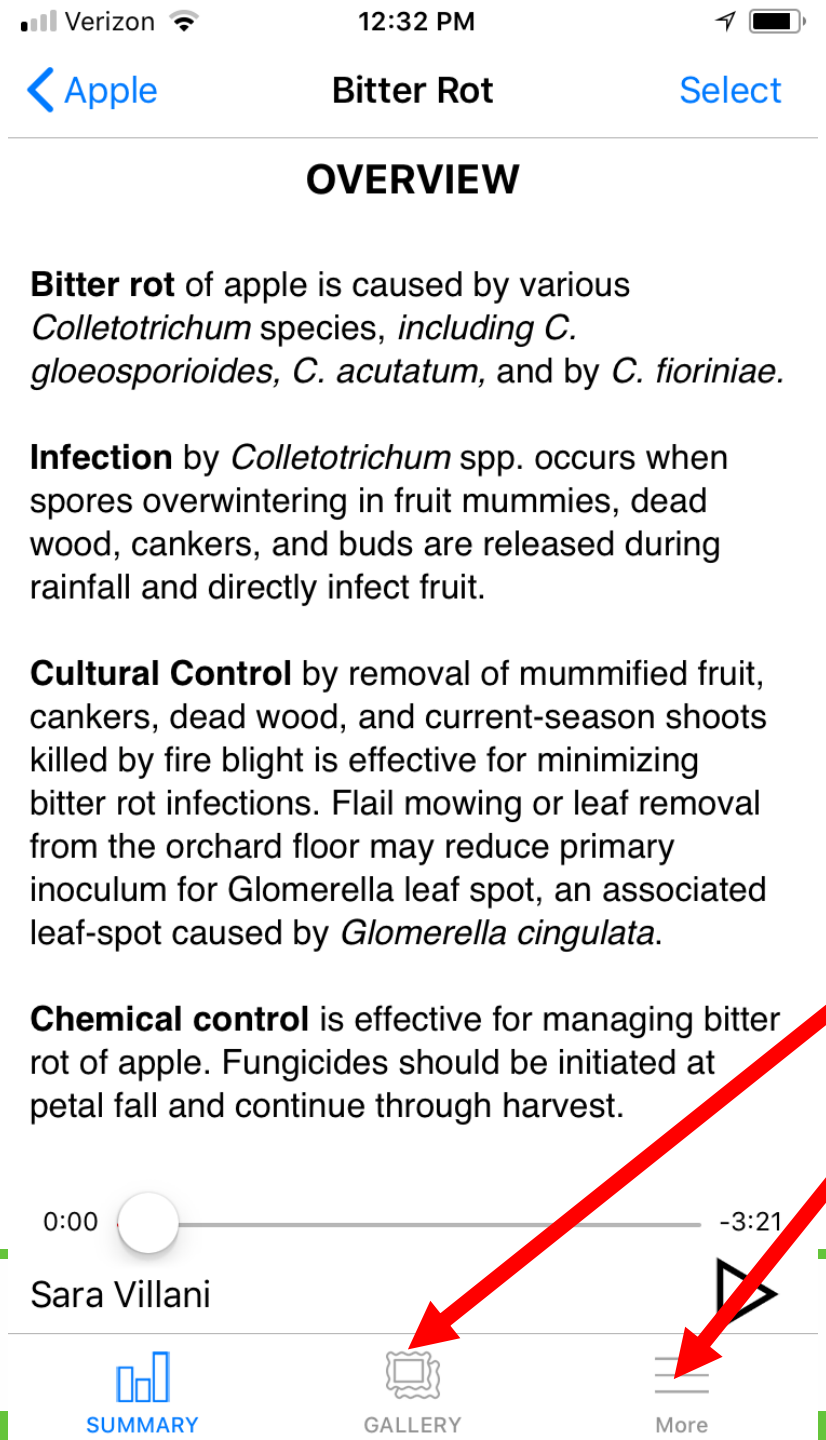
- you can download all content, or only topics you want

Once you’ve downloaded your topics, click one to see content

“MyIPM” – free mobile app



- Swipe photos left/right to see different diseases or pests
- Click on picture or Overview/Gallery/More for photos and management info
- Active Ingredients, Trade Names, & Pesticide Resistance geared towards commercial growers



MyIPM Mobile App

Example of "Overview" screen including

- Pathogen name
- Disease cycle
- Cultural control strategies
- Chemical control strategies
  - Chemicals geared towards commercial growers
- Click "GALLERY" to see more photos
- Click "More" for additional info

Muscadine disease issues

- Muscadine (*Vitis rotundifolia*) **resistant** to:
  - Pierce's disease (*Xylella fastidiosa*)
  - Downy mildew (*Plasmomara viticola*)
  - Botrytis bunch rot (*Botrytis cinerea*)

- **Susceptible** to:
  - Powdery mildew (*Erysiphe necator*)
  - Bitter rot (*Greeneria uvicola*)
  - Black rot (*Guignardia bidwellii*)
  - Ripe rot (*Colletotrichum* spp.)

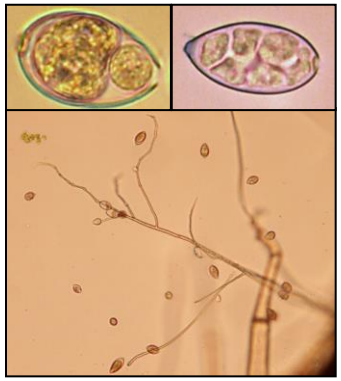
General grape production comments

- Start with clean, certified material from reputable nurseries
  - Virus infections can't be cured
- Choose rootstocks with Phylloxera resistance and nematode tolerance
- Trellis and prune to maximize airflow and sunlight penetration (minimize disease pressure & maximize spray coverage)

The Disease Triangle

Host

Disease



Pathogen

Environment

Black rot

- Fungus – *Guignardia bidwellii*
- Favored by warm humid weather
- Can cause serious losses if unmanaged

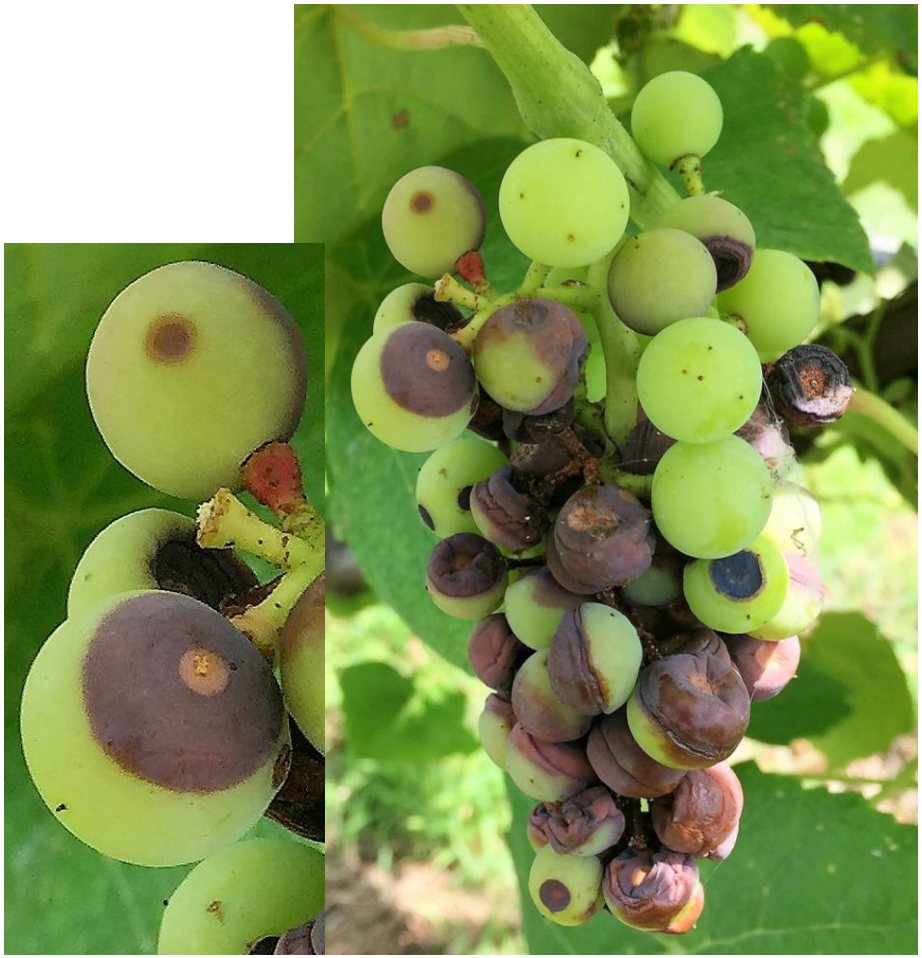
Black rot symptoms

- Leaf symptoms
  - Circular, cream colored / brown, dark band around margin
  - Black spore structures (pycnidia) visible

Photo credit: University of Georgia Plant Pathology bugwood.org

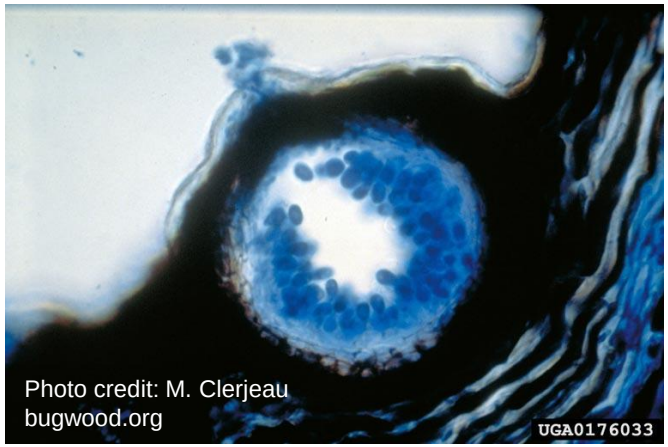
Black rot symptoms

- Fruit symptoms
  - Small cream colored dot surrounded by area of dark tissue
  - Eventually entire fruit rots, dries, and remains attached as a mummy



Black rot disease cycle and spread

- Overwinters in mummies and cane lesions
- Spores release in early season to start disease
- Lesions produce more spores to spread disease during season
  - Spores are windborne



Black rot management

- Sanitation (crucial for organic production)
  - Prune mummies, cankers, dead wood
    - Remove from vineyard if possible
  - Mulching vineyard floor may reduce spore dispersal
- Fungicides (consult IPM Guide)
  - Should be used from bloom → 6 weeks post bloom to protect berries
    - Abound, Luna Experience, Mancozeb, Rally, Elite, Flint, others..

Ripe rot

Fungus – *Colletotrichum* spp.

- Symptoms
  - Ripe fruit rot
  - Reddish brown spots on fruit eventually cover whole berries
  - Berries shrivel and usually remain attached
  - Salmon-colored spores on fruit are diagnostic

Photo credit: Turner Sutton, NC State
https://grapes.extension.org/ripe-rot-of-grapes/

Ripe rot

Fungus – *Colletotrichum* spp.

- Disease cycle
  - Overwinters in mummified fruit
  - Fruit may be infected any time from bloom to harvest
    - Fruit don’t show symptoms until they begin to ripen

Photo credit: Turner Sutton, NC State
https://grapes.extension.org/ripe-rot-of-grapes/

Ripe rot

Fungus – *Colletotrichum* spp.

- Cultural management
  - Prune out dead material
  - Remove mummified fruit
  - Manage canopy to improve air movement

Photo credit: Michigan State University Extension

Ripe rot

Fungus – *Colletotrichum* spp.

- Chemical management
  - Fungicides from bloom to harvest may be needed if disease pressure is high
  - Captan, QoIs work well
  - DMIs not effective

Photo credit: Michigan State University Extension

Sour rot

- Ideal conditions for sour rot
  - At least 15 °Brix
  - 68°-77°F
  - Rain
- Symptoms on fruit only
  - White-variety grapes turn tan/light brown
  - Red-variety grapes turn brown/red
  - Berries become shriveled, rot, and decompose
  - Visual symptoms may be confused with other bunch rots like black rot or botrytis

Photo credit: Y. Woodworth
Ohio State University

Photo credit: M. Ivey, L. Wodzickui, E. Long
Ohio State University

Sour rot

- Symptoms on fruit only
  - White-variety grapes turn tan/light brown
  - Red-variety grapes turn brown/red
  - Berries become shriveled, rot, and decompose
  - Visual symptoms may be confused with other bunch rots like black rot or botrytis
  - **Notable symptom – vinegar smell and associated insects, especially yellow jackets**

Photo credit: Y. Woodworth
Ohio State University

Sour rot – disease cycle and spread

- Requires wounded fruit to develop
- Fruit flies visit wounded fruit and spread bacteria (*Acetobacter* spp. & *Gluconobacter* spp.)
  - Common fruit flies cannot wound fruit (*Drosophila melanogaster*)
  - Spotted-wing drosophila can wound fruit (*D. suzukii*)

Photo credit: Megan Hall
Cornell University

Sour rot – disease cycle and spread

- Bacteria & wild yeast (*Saccharomyces* spp.) produce vinegar (acetic acid)
- Acetic acid attracts other insects which spreads sour rot between clusters

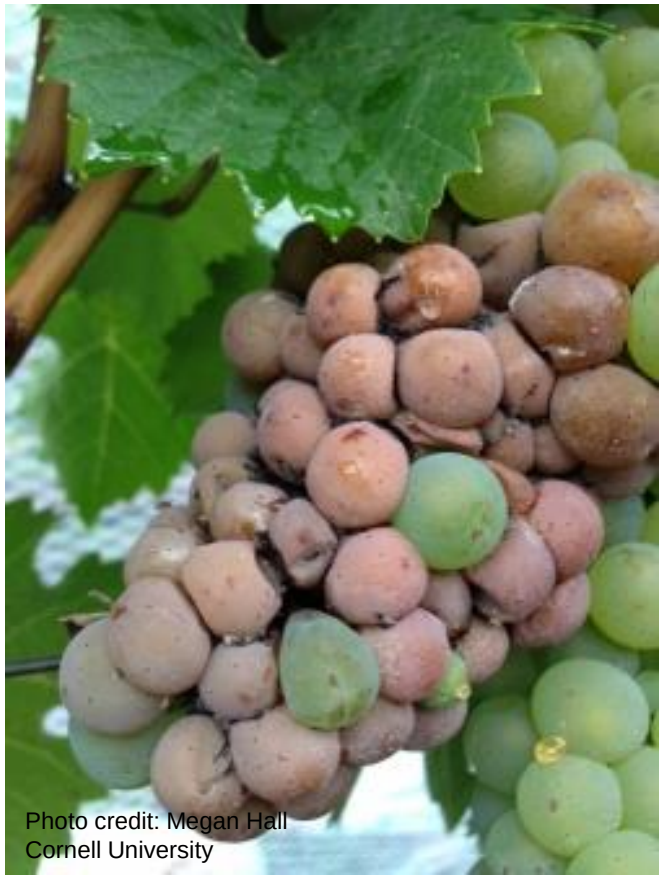


Photo credit: Megan Hall
Cornell University

Sour rot cultural management

- Early maturing & tight cluster varieties = more susceptible
- Late maturing & loose cluster varieties = less susceptible
- Avoid damaging fruit
- Bird management (netting) from veraison through harvest
- Scout and remove infected clusters

Sour rot chemical management

- Insecticides to manage fruit flies at symptom onset or 15 °Brix
  - See grape IPM guide for latest recommendations
- Hydrogen peroxide or peroxyacetic acid can help manage sour rot-associated bacteria
- Zeta-cypermethrin (Mustang Maxx) and hydrogen dioxide (Oxidate) sprayed twice after around 15-Brix

Other diseases to be aware of

- Botrytis (bunch rot, blight, gray mold)
  - Fungus – *Botrytis cinerea*

Management

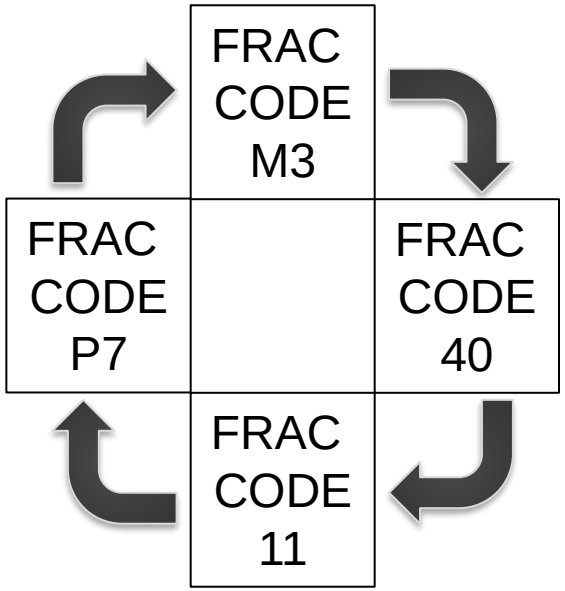
- Resistant cultivars
- Site selection and establishment – air flow
- Canopy management
- Fungicides
  - Resistance widespread – rotate FRAC groups

Other fruit rots to be aware of

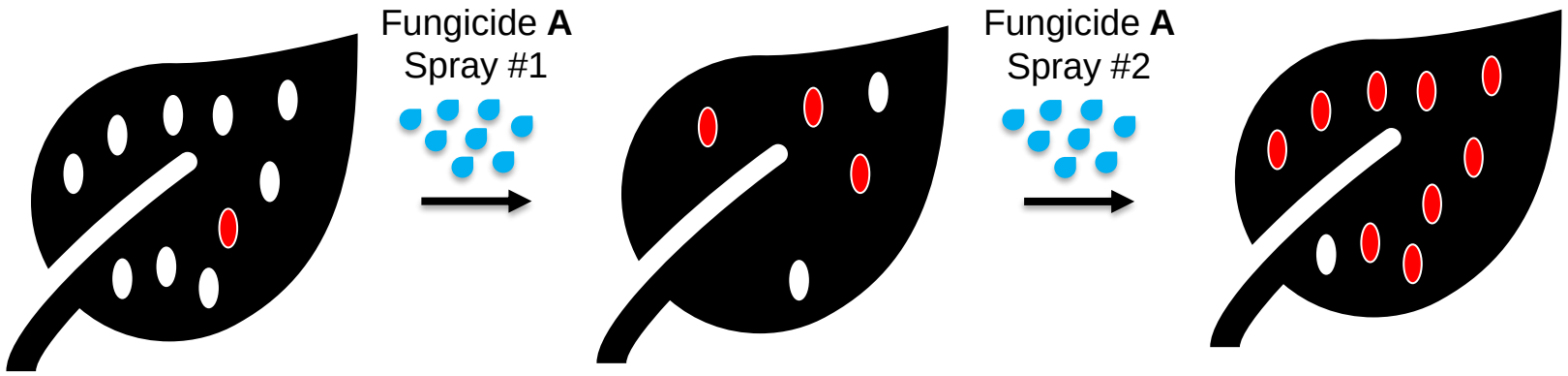
Fungicide resistance in the Southeast

- FRAC group 1 (benzimidazoles): powdery mildew, botrytis
- FRAC group 11 (QoIs): powdery mildew, botrytis, ripe rot, downy mildew
- FRAC group 13 (Quintec): powdery mildew
- FRAC group 40 (Revus): downy mildew

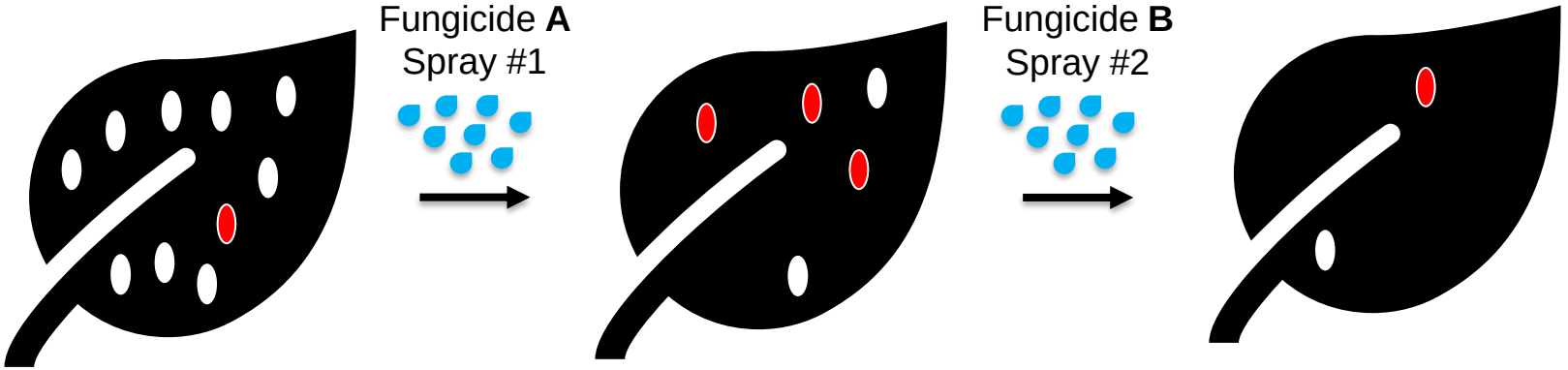
Rotate fungicides



Consequence of not rotating fungicides



Benefit of rotating fungicides



= fungicide-sensitive spores
= fungicide-resistant spores

Focus on cultural practices

1. Site selection
   - Goal: encourage air movement
2. Variety selection
   - Goal: choose disease-resistant varieties
3. Canopy management
   - Goal: encourage air movement, sunlight & spray penetration
4. Sanitation
   - Goal: reduce disease pressure

Organic pesticides

- Organic pesticides are still important to disease management
  - Must follow cultural practices
  - Organic pesticides alone are not enough
  - In most cases, diligent cultural maintenance & timely pesticide applications are necessary for success

**Some varieties are sensitive to copper or sulfur and may be difficult to manage organically

1. Site selection

Disease management goal: encourage air movement

- Plant on a slope
- Avoid low-lying areas
- Grapes need full sun
- Avoid close proximity to wooded areas
  - May restrict air movement and harbor diseases and pests

2. Variety selection

Disease management goal: limit disease susceptibility

Less susceptible to several diseases

- American grapes
  - *Vitis labrusca*
  - *Vitis aestivalis*
- French-American hybrids
- Muscadine
  - *Vitis rotundifolia*

Highly susceptible to several diseases

- European varieties
  - *Vitis vinifera*

3. Canopy management

Disease management goal: encourage air movement, sunlight & spray penetration

- Pruning – annual removal of plant parts
- Training – developing the vine framework on the trellis
  - Both impact air movement, sun exposure, and spray penetration

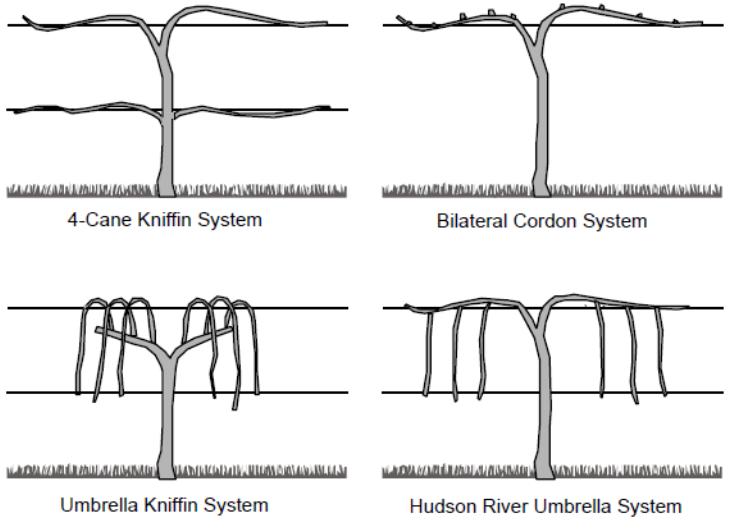


Figure credit: Dave Lockwood, PB 1475

4. Sanitation

Disease management goal: reduce disease pressure

- Leaf removal
- Mummified fruit removal
- Pruning debris removal
- Several pathogens overwinter in crop debris
  - Removal of debris reduces disease pressure the following season
    - Crucial to keep disease levels as low as possible with limited pesticide options

Take-aways

- Learn to identify common diseases and be prepared to make preventative fungicide applications (MyIPM app helpful for this)

Step #1 in plant problem management = proper diagnosis

www.soillab.tennessee.edu/

Contact Information

Zach Hansen
zhansen1@utk.edu
G059 McCord Hall
865-974-7784
www.utspecialtycrop.com

@UTSpecialtyCrop