

Update on Muscadine Diseases -- and new fungicide data from 2020

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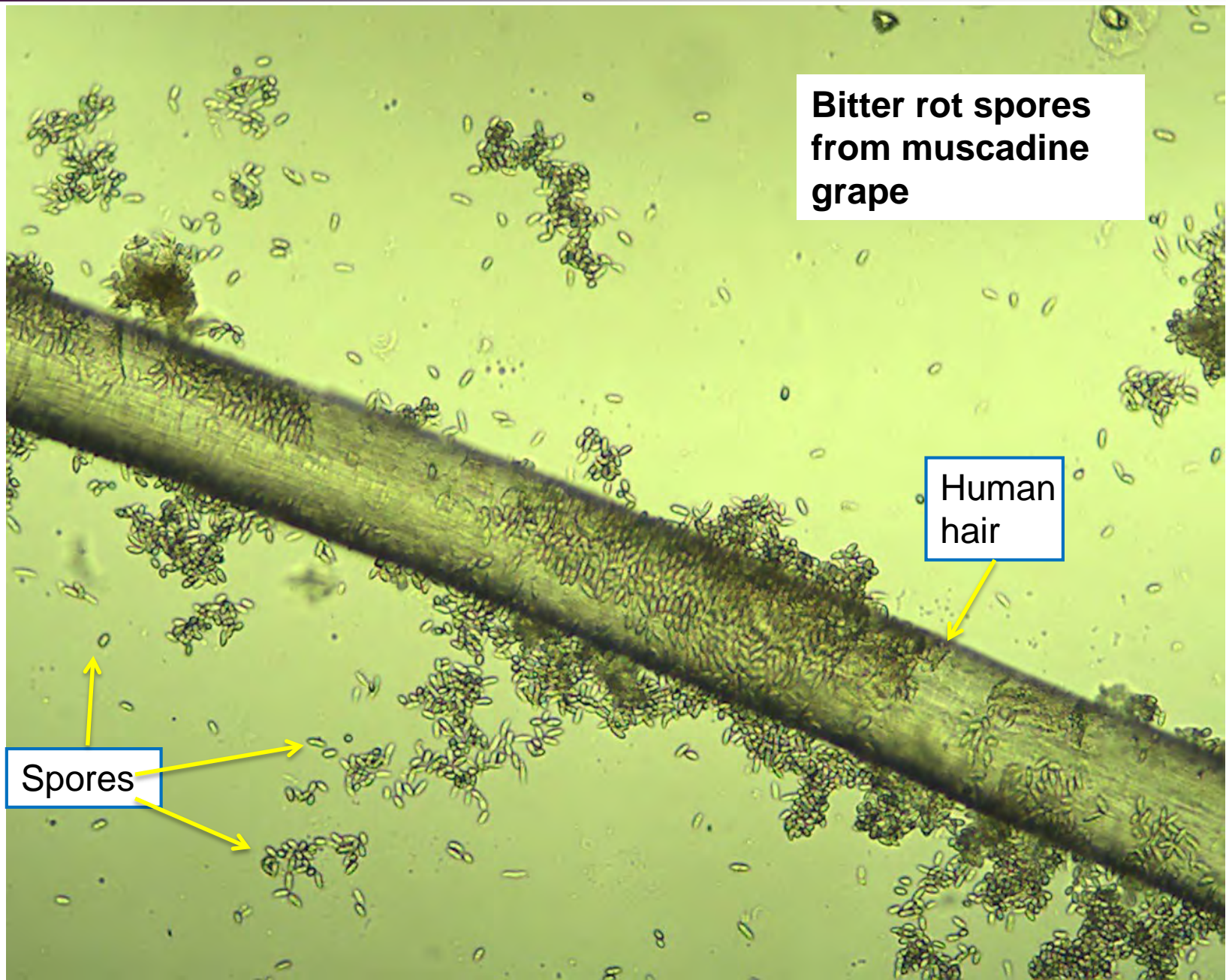
Muscadines are Tough!

- Resistant to Pierce's Disease (*Xylella fastidiosa*) that kills many bunch grape types
- Often not sprayed for disease control when grown for wine production
- Muscadines in backyard plantings are usually not sprayed
- Sour rot rarely seen
- Muscadines are resistant to many fungal pathogens:
 - No Downy Mildew, Bunch Grape Anthracnose or Botrytis gray mold
 - Resistant to Phomopsis
 - Physically tough, thick-skinned
 - Sulfur can be used to control Powdery Mildew

Leaf and fruit diseases of muscadine grape

- Mostly caused by fungi
- Spores are microscopic
- Spread by wind, splashing rain, or insects
- Most spores require moisture to germinate and infect





**Bitter rot spores
from muscadine
grape**

Human
hair

Spores

Fungal pathogens overwinter in old, infected plant parts, releasing spores that infect new emerging shoots in the spring





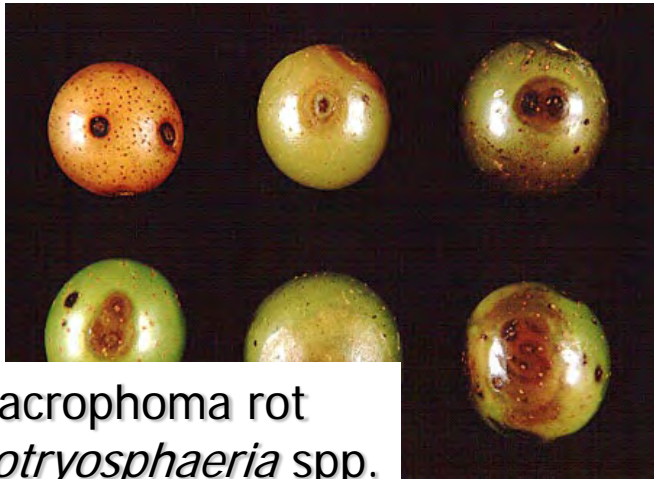




MUSCADINE FRUIT AND LEAF DISEASES

SIGNS & SYMPTOMS

Fruit Rots



Macrophoma rot
Botryosphaeria spp.



Ripe rot
Colletotrichum spp.



Bitter Rot
Greeneria uvicola



Sooty mold
Peltaster fructicola



Ripe rot at harvest

Leaf Diseases



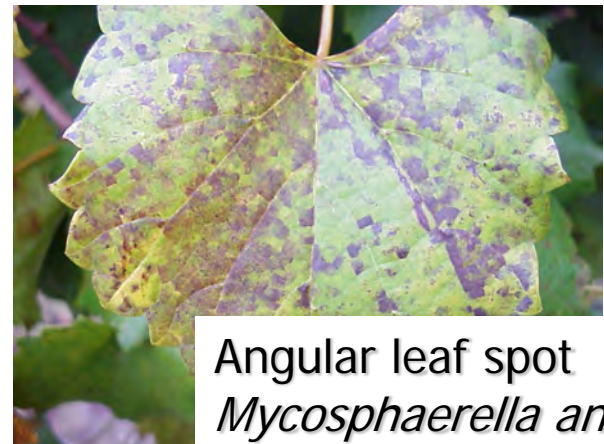
Bitter Rot
Greeneria uvicola



Black rot
Guignardia bidwellii



Pierce's Disease
Xylella fastidiosa



Angular leaf spot
Mycosphaerella angulata



Black rot on leaves

Powdery Mildew

- Fungus (*Uncinula necator*)
- Appears as faint white “powder” on young fruit
- Causes brown russeting on surface
- Affected fruit cannot ripen normally; may crack









Management and Control of Muscadine Diseases



Disease Management Tools

- Start with clean plants
- Select disease-resistant cultivars
- Good cultural practices (fertility, canopy management, timely harvest, proper pruning)
- Fungicides

Tissue Culture for Muscadines

- Disease-causing organisms can carry over in cuttings used to start new plants
- Crops that are propagated vegetatively by cuttings can be kept clean by using tissue culture and virus testing to grow clean, sterile plants in the lab
- Lab-grown plants can then be used as a source of clean cuttings going forward



“Start Clean and Stay Clean”

Disease Resistance in Muscadines

- Resistant to Pierce's Disease
- No Downy Mildew
- No Botrytis Bunch Rot
- Resistant to Nematodes
- Not Grafted
- Few (if any) Viruses
- Few rots on dark-fruited cultivars



cv. Noble



Good Cultural Practices

- Fertility – avoid over-fertilization
- Canopy management – weed control, summer pruning to promote air movement
- Timely, complete harvest – esp. critical with hand-harvest for fresh
- Winter pruning to remove overwintering diseases

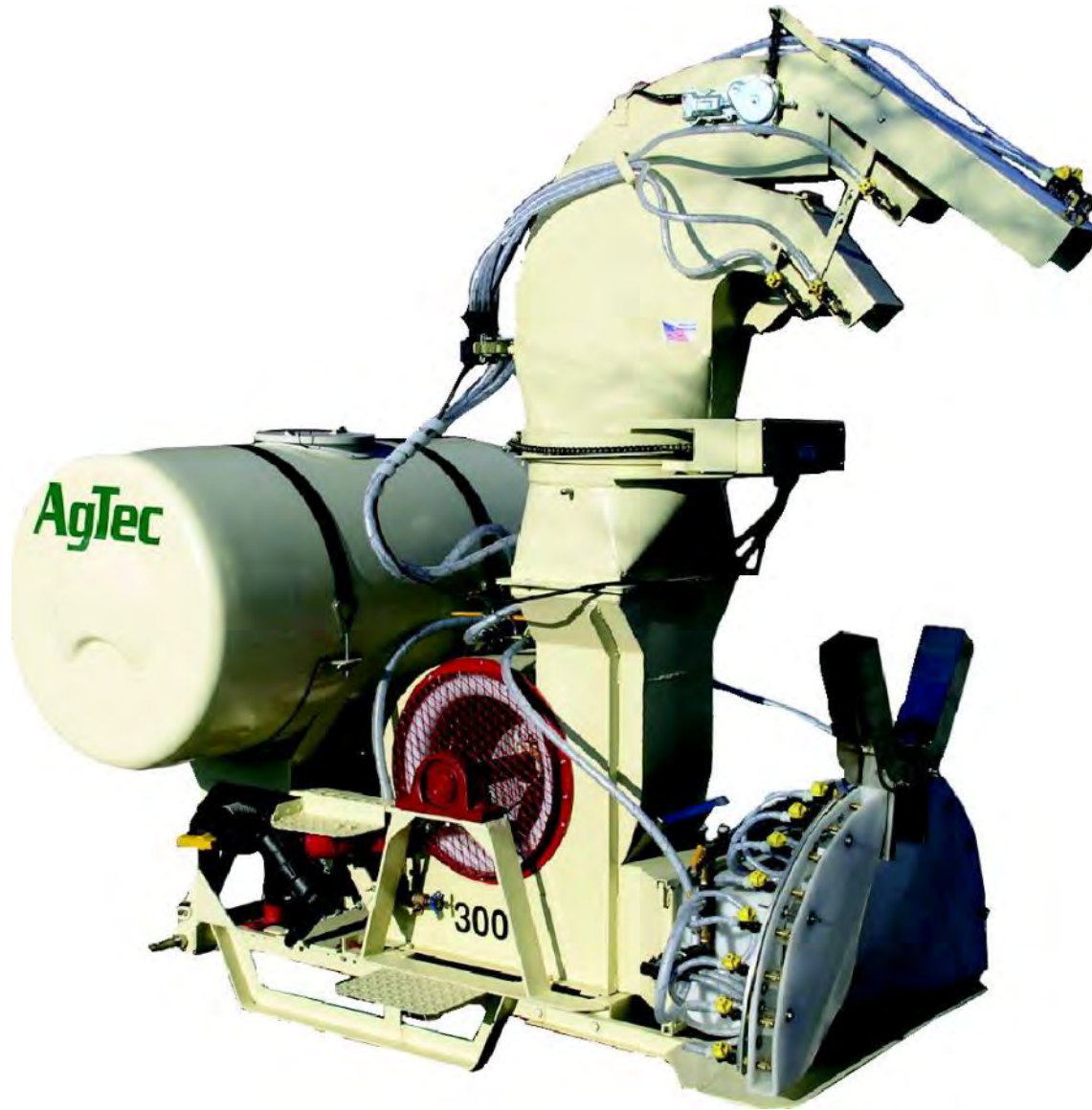
Fungicides, Sprayers and Spray Timing



Sprayers

- Airblast with 20-40 gallons per acre, OR
- High-pressure sprayer with 50-100 gallons per acre
- Sprayer must be designed to reach grapes underneath the canopy





NO

For muscadine disease
Control, spray up, not
down!

YES



<http://www.superhorticulture.com>



<http://vtpv.ext.vt.edu>

Spray Timing – much simpler for muscadine (compared to Vinifera)

- Mid-May (Before disease is visible!!)
- Shoots 6-10 inches in length
- Flowers not yet open
- Continue every 2 wk until early August
- Early summer sprays provide more disease control than later sprays, because fungicides are mainly protectants
- Write it down



Nita, January 2016

Summary cont.

Vinifera

- Modes of action used
 - M1 (copper) x 2 times
 - M2 (sulfur) x 11 times
 - M3 (mancozeb) x 7 times
 - M4 (captan) x 4 times
 - 2 (Rovral) x 2 time
 - 3 (Rally) x 2 times
 - 9 (Scala) x 1 times
 - 13 (Quintec) x 1 time (+1)
 - 33 (Phosphite, Phostrol) x 2 times (+ 2-3 times)

Muscadine

Mancozeb 1-2X
Captan 3-6X
Rally 3-6X

“Standard” Fungicide Recommendations for NC

- Mancozeb early (66 d PHI)
- Alternate or tank mix myclobutanil (Rally) with Captan, apply every 2 wks from Mid-May through August
- Where ripe rot is a problem (shown), replace or supplement Captan with a strobilurin fungicide (such as Abound, Pristine or Flint)
- ALWAYS READ AND FOLLOW THE LABEL!



Ripe rot



2020 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)
Entomology; Brett Blaauw (University of Georgia), Frank Hale (University of Tennessee) and Hannah Burrack
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Vertebrate Management; David Lockwood (University of Tennessee)
Pesticide Stewardship and Safety; Ash Sial (University of Georgia)

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Contributions were also made by Ed Sikora (Auburn University), Rebecca Melanson (Mississippi State University).

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What about Newer Fungicides?

- Most not tested on muscadine
- Do they work?
- Are they safe?



Spray burn on 'Doreen' muscadine

Efficacy and crop safety of untested fungicides for diseases of muscadine grape, 2020

- **Many fungicides labeled for grape have never been tested on muscadines**
- **Are the products safe (no crop injury?)**
- **Will these fungicides work on diseases that affect muscadines (efficacy)?**
- **Experiments conducted in NC and GA in 2020**
- **Funded by the Southern Region Small Fruit Consortium (Brannen at UGA, Cline at NCSU)**

Fungicide “Standards” Known to Work	FRAC Code
Captan	M4
Rally	3
Abound	11
Pristine	7+11
Flint	11
Mancozeb	M3

“New” Products Evaluated in 2020	FRAC Code
Aprovia	7
Aprovia Top	3+7
Gavel	22+M3
Switch	9+12
Miravis Prime	7+12
Luna Experience	3+7
Topguard EQ	3+11
Kenja	7
Procure	3
Merivon	7+11
Badge (copper)	M1

Materials and Methods

- **Randomized, replicated trials in NC and GA**
- **Fungicides applied 4x (NC) or 6X (GA) at pre-bloom, bloom, and green fruit stages**
- **Crop injury evaluated August and September on leaves and fruit (NC and GA)**
- **Leafspot incidence and severity rated 28 Aug (NC)**
- **Fruit harvested 9 Sep (NC) and sorted for incidence of ripe rot, bitter rot and macrophoma rot**

Treatment and rate per acre	Ripe rot % ^z	Bitter rot %	Macrophoma rot %	Marketable %	Angular leaf spot ^y	
					incidence	severity
Untreated control	2.9 abcd ^x	5.6 a	8.1 a	86.8 a	80.0 a	15.0 a
Aprovia 10.5 fl oz	1.4 abcd	2.6 bc	1.4 cd	94.8 cd	12.5 bc	2.2 bc
Aprovia Top 13.3 fl oz	1.4 abcd	0.1 c	0.9 cd	97.4 cd	1.2 c	1.2 c
Gavel 2.5 lb	2.0 abcd	2.0 bc	3.8 bc	92.2 abc	0.2 c	0.2 c
Switch 14.0 oz	0 d	1.0 c	0.2 d	98.9 d	23.8 b	5.0 b
Miravis Prime 13.4 fl oz	0.3 d	1.2 c	1.1 cd	97.7 cd	7.5 c	1.5 bc
Luna Experience 8.6 fl oz	4.1 a	2.0 bc	3.6 bc	92.2 abc	0 c	0 c
Topguard EQ 8.0 fl oz	0.6 bcd	1.0 c	1.8 cd	97.0 cd	0 c	0 c
Kenja 22.0 fl oz	0.5 cd	1.7 c	0.8 cd	97.4 cd	13.8 bc	2.0 bc
Badge SC 3.5 pt	3.5 abc	4.6 ab	6.0 ab	87.7 ab	8.8 bc	2.8 bc
Procure 8.0 fl oz	3.8 ab	0.6 c	2.6 cd	92.7 bc	10.0 bc	3.5 bc
Merivon 5.5 fl oz	0.8 bcd	0.2 c	1.5 cd	97.4 cd	0.2 c	1.2 c
LSD	3.18	2.78	3.26	5.91	15.76	3.73

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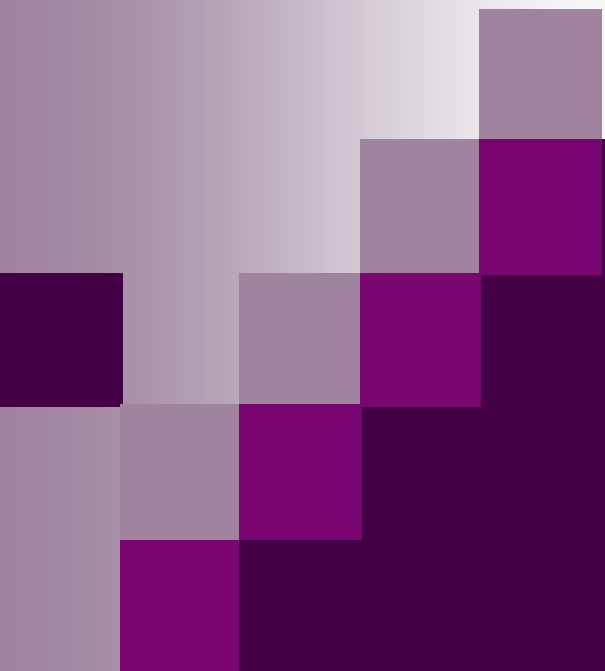
**No phytotoxicity
observed with any newly
tested products in 2020**

*****Increased marketable
yield (vs no spray)**

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Efficacy and crop safety of untested fungicides for diseases of muscadine grape, 2020

- **Success – we have data now, need to repeat trials**
- **No injury observed on fruit or leaves with any products**
- **Improve/Expand our regional recommendations**
- **More fungicide choices/MOAs for disease control**
- **Thanks to the Southern Region Small Fruit Consortium for funding this work**



Cultural Problems Abiotic and Chemical Injury

NCSU-PDIC

Of the most recent 27 muscadine disease samples submitted for diagnosis, 14 were abiotic/cultural problems rather than disease.

- Lack of pruning
- Poorly drained site (“wet feet”)
- Trunk injury from freezing or other causes
- Herbicide injury (2,4-D most common)

“Orange Slime” on muscadine grapes occurs when bacteria and yeasts colonize leaking sap.

Common on pruning wounds

Shown here, a cold-damaged trunk with sap leaking from the injury.



Hail damage to green fruit



2,4-D herbicide injury



2,4-D on blueberry (and nearby oak)



Spray burn on fruit – usually on the side “facing” the sprayer. Caused by phytotoxic chemicals or a tank mix of incompatible chemicals (oils or surfactants with certain wettable powders)



S-metolachlor
(Dual Magnum)
Applied to
peanut field
drifted onto
muscadines and
corn in adjacent
fields



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Superficial
“tar spot”
from spray
injury can
be peeled
off

Spray burn from tank mix with GPA too low, so off-label





Avoiding tank mix problems

- When in doubt, don't do it!
- Avoid mixing different formulations (EC with WP, etc)
- Surfactants are often not necessary and can be injurious
- Read and follow the label – if you do not, you have no recourse when injury occurs

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Insect pests on muscadine

- Dr. Hannah Burrack is the entomology specialist covering muscadines at NCSU
- Although a number of insects feed on various parts of grape vines the grape root borer does the greatest long term damage
- Occasional leaf- and fruit-feeding insects are controlled on an as-needed basis

Adult Female Grape Root Borer





Aerial roots = stress indicator
Possible GRB injury to roots



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Grape Root Borer Control Options

- Mounding – August 1 in NC, must remove mounds in Nov-Dec.
- Lorsban (chlorpyrifos) 4.5 pts/100 gal, apply 2 qts solution/vine, 35 day PHI
- Mating disruption – Isomate GRB – use 100 ties per acre (every other vine)

Japanese beetles cause obvious damage but vines survive and productivity is not usually diminished





Japanese beetles eating late-blooming flowers



Aphids and predators,
larvae of a lady beetle
species



Stink Bug Damage??



