Disease management update for muscadines in the Southeast

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2020 Southeast Regional Muscadine Grape Integrated Management Guide

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Muscadine Grape Production Guide for the Southeast

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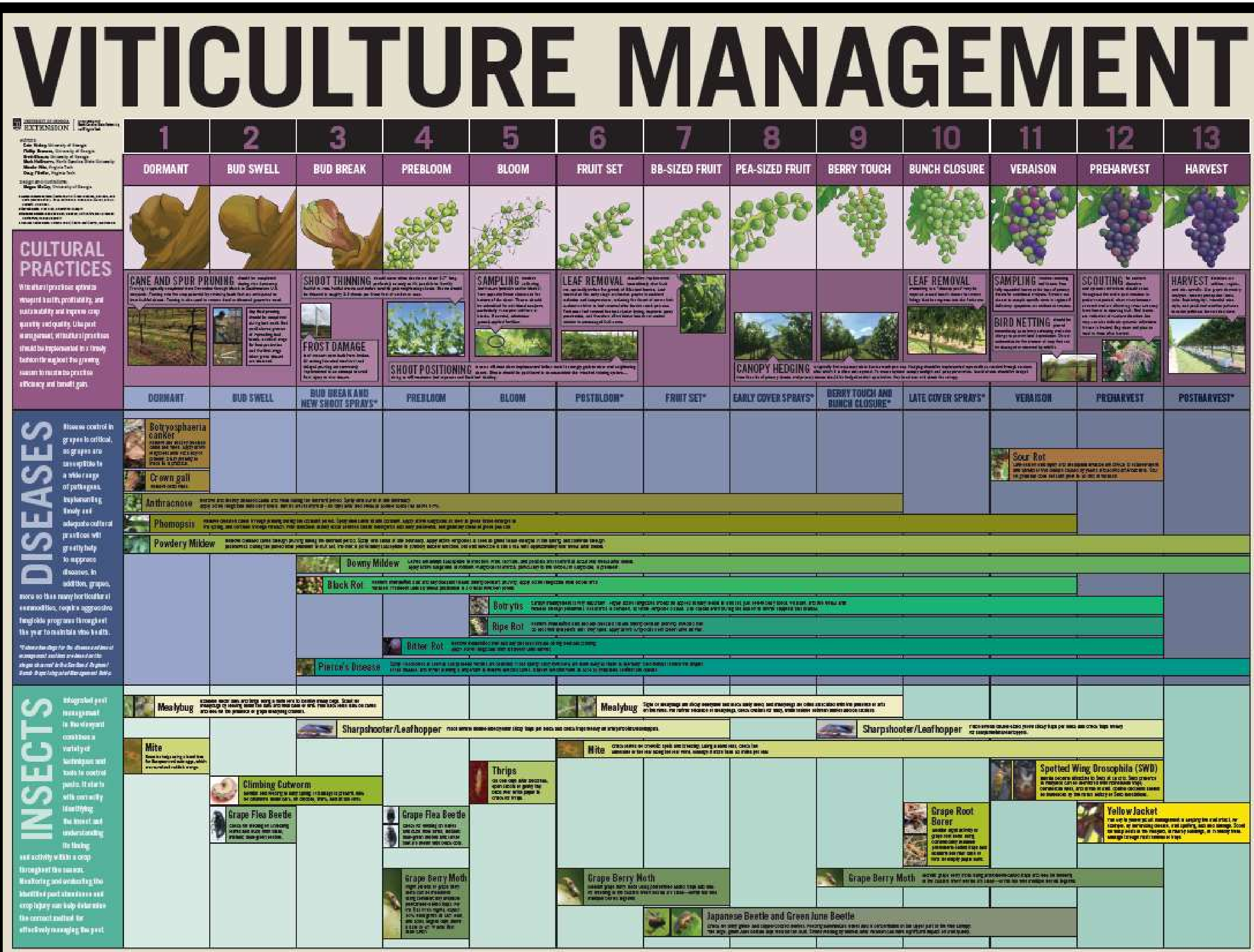

VITICULTURE MANAGEMENT
EXTENSION
CULTURAL PRACTICES
Viticultural practices optimize vineyard health, profitability, and sustainability and improve crop quantity and quality. Like pest management, viticultural practices should be implemented in a timely fashion throughout the growing season to maximize practice efficiency and benefit gain.
1 DORMANT
2 BUD SWELL
3 BUD BREAK
4 PREBLOOM
5 BLOOM
6 FRUIT SET
7 BB-SIZED FRUIT
8 PEA-SIZED FRUIT
9 BERRY TOUCH
10 BUNCH CLOSURE
11 VERAISON
12 PREHARVEST
13 HARVEST
CANE AND SPUR PRUNING
SHOOT THINNING
FROST DAMAGE
SHOOT POSITIONING
SAMPLING
LEAF REMOVAL
CANOPY HEDGING
LEAF REMOVAL
SAMPLING
BIRD NETTING
SCOUTING
HARVEST
DORMANT
BUD SWELL
BUD BREAK AND NEW SHOOT SPRAYS*
PREBLOOM
BLOOM
POSTBLOOM*
FRUIT SET*
EARLY COVER SPRAYS*
BERRY TOUCH AND BUNCH CLOSURE*
LATE COVER SPRAYS*
VERAISON
PREHARVEST
POSTHARVEST*
DISEASES
Disease control in grapes is critical, as grapes are susceptible to a wide range of pathogens. Implementing timely and adequate cultural practices will greatly help to suppress diseases. In addition, grapes, more so than many horticultural commodities, require aggressive fungicide programs throughout the year to maintain vine health.
Botryosphaeria canker
Crown gall
Anthracnose
Phomopsis
Powdery Mildew
Downy Mildew
Black Rot
Botrytis
Ripe Rot
Bitter Rot
Pierce's Disease
Sour Rot
INSECTS
Integrated pest management in the vineyard combines a variety of techniques and tools to control pests. It starts with correctly identifying the insect and understanding its timing and activity within a crop throughout the season. Monitoring and evaluating the identified pest abundance and crop injury can help determine the correct method for effectively managing the pest.
Mealybug
Sharpshooter/Leafhopper
Mite
Climbing Cutworm
Grape Flea Beetle
Grape Flea Beetle
Thrips
Mealybug
Sharpshooter/Leafhopper
Mite
Spotted Wing Drosophila (SWD)
Grape Root Borer
Yellow Jacket
Grape Berry Moth
Grape Berry Moth
Grape Berry Moth
Japanese Beetle and Green June Beetle

Primary Southeastern Muscadine Diseases that Require Fungicide Applications

- Bitter Rot (*Greeneria uvicola;* syn. *Melanconium fuligineum*)
- Ripe Rot (*Glomerella cingulata*)
- Macrophoma Rot (*Botryosphaeria dothidea*)
- Black Rot (*Guignardia bidwellii* f. *muscadinii*)
- Powdery Mildew (*Uncinula necator*)
- Angular Leaf Spot (*Mycosphaerella angulata*)

Though muscadines are not generally as susceptible to diseases as Vinifera grapes, disease control is very important. Producers often "get by" with minimal spray programs in dry years, only to be "hammered" in wet years. Preventive spray programs are necessary.

Percent Infected Leaves or Fruit (Carlos Variety)

	Angular Leaf Spot	Bitter Rot	Powdery Mildew (fruit)	Macrophoma Rot	Black Rot (fruit)	Black Rot (leaf)
UTC	35	10	26	1	12	22
Sprayed	11	<1	<1	<1	<1	0

W. O. Cline and B. Bloodworth; 2001 Muscadine Disease Survey

Percent Infected Leaves or Fruit (Carlos vs. Noble Varieties)

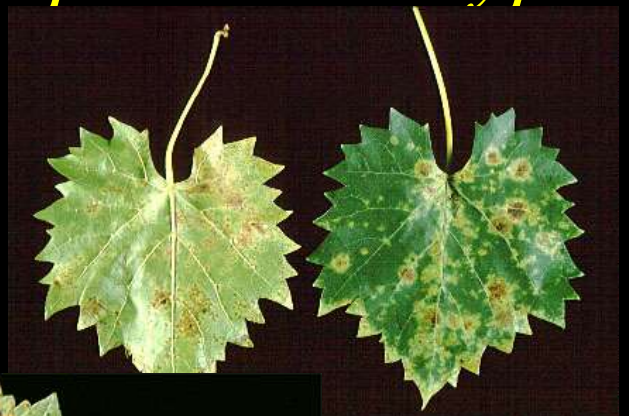
	Angular Leaf Spot	Bitter Rot	Powdery Mildew (fruit)	Macrophoma Rot	Black Rot (fruit)	Black Rot (leaf)
UTC Noble	5	3	23	0	0	0
UTC Carlos	50	8	45	<1	21	32

W. O. Cline and B. Bloodworth; 2001 Muscadine Disease Survey

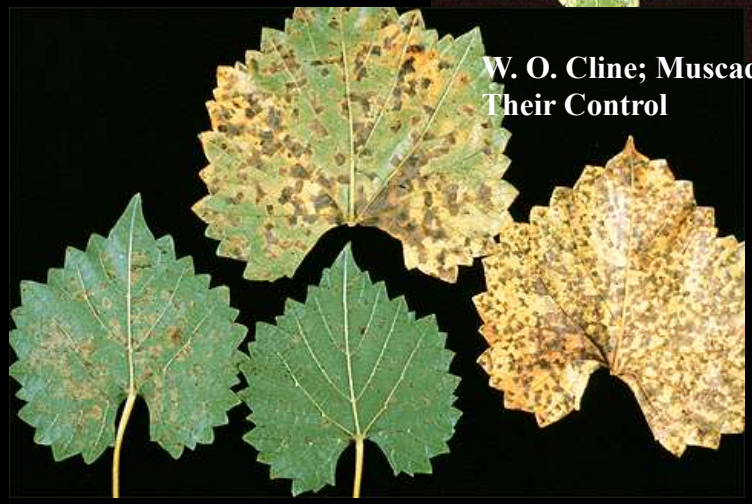
Angular Leaf Spot

(*Mycosphaerella angulata* or *Cercospora brachypus*)

- Great potential to limit yield in muscadine – not Vinifera.
- Defoliates the vine, and fruit development ceases (poor yield and quality).
- Mancozeb and Captan offer effective control.
- Applications made pre bloom (budbreak; some references say shoot extension) and on a 14-day schedule till late August.



W. O. Cline; Muscadine Grape Diseases and Their Control



APS Press; Diseases of Small Fruits

Bitter Rot
(*Greeneria uvicola*)

- Infection occurs at shoot extension, during or shortly after bloom in the pedicel – latent infection.
- Any tissue can be invaded, but mature, ripened fruit is most susceptible to full disease expression.
- Late season (bloom through preharvest) sprays are important. Major muscadine disease.

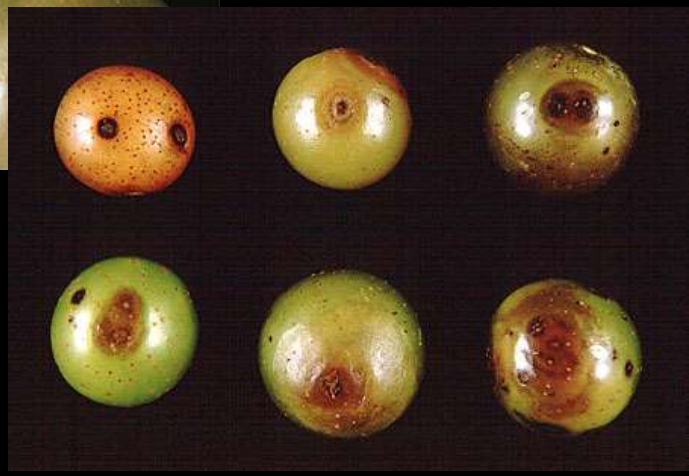
W. O. Cline; Muscadine Grape Diseases and Their Control

APS Press; Diseases of Small Fruits

Macrophoma Rot
(*Botryosphaeria dothidea*)

- Can be very destructive in muscadines.
- Not *Macrophoma* (*Fusicoccum aesculi*).
- Very little known about the epidemiology.
- Can be controlled by fungicide applications from bloom till harvest.

APS Press; Diseases of Small Fruits



W. O. Cline; Muscadine Grape Diseases and Their Control

Ripe Rot
(*Glomerella cingulata*)

- Can infect at any stage of fruit development.
- Rots do not show up till fruit ripens.
- Controlled through normal fungicide program for black rot.

W. O. Cline; Muscadine Grape Diseases and Their Control

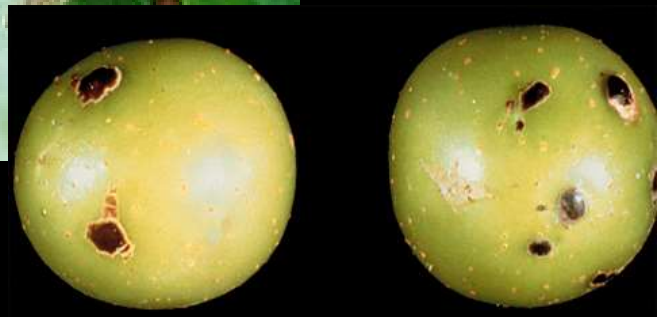
APS Press; Diseases of Small Fruits

Black Rot

(*Guignardia bidwellii* f. *muscadinii*)

- Major problem in bunch grapes.
- If muscadines are sprayed with standard fungicides (i.e. Maneb and Captan), this is generally not a major problem.
- Control with early-season applications.

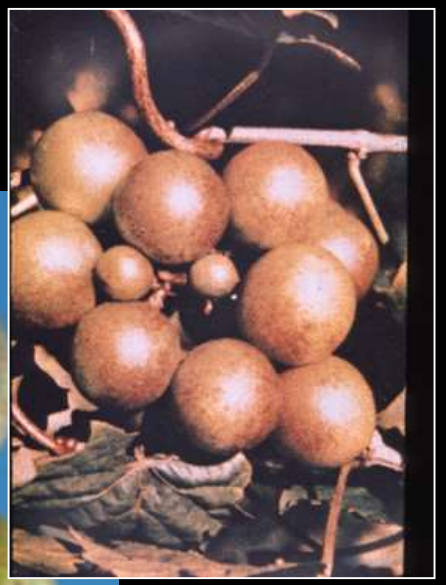
W. O. Cline; Muscadine Grape Diseases and Their Control



APS Press; Diseases of Small Fruits

Powdery Mildew
(*Uncinula necator*)

- Attacks leaves, cluster stem, and fruit shortly after bloom.
- Infected fruit become "russetted" and may crack.
- Can also result in fruit drop and/or reduced size.



W. O. Cline; Muscadine Grape Diseases and Their Control

Table 3 - Muscadine Grape Disease Spray Program

Application Time	Fungicide*	Amount/Acre	Remarks
First, just before bloom	Mancozeb or Captan 50WP	2 - 3 lb 3 lb	
Second, just after bloom and fruit set	Nova 40W or Abound	1.2 - 2 oz 11 - 15 oz	Do not omit application. Important for reducing bitter rot and other fruit infections.
Continue at 14-day intervals	Nova 40W or Abound	Above Rates	Use shorter application intervals during rainy periods. Extend application interval if conditions do not favor disease development.
Preharvest sprays beginning 6 to 8 weeks before harvest	Captan 50WP or Nova 40W or Abound	3 lb Above Rates	Necessary for berry rot control. Shorten application interval to 7 to 10 days if rainy conditions exist during berry maturation. Pay attention to days until harvest.

Minimum days from last application until harvest:
Nova – (14); Captan – (0); Mancozeb – (66); Abound – (14)

Braswell et al.; MSU

Fungicides – the short version

- Alternate Nova with Captan, apply every 2 wks from Mid-May through August
- Where ripe rot is a problem, replace Captan with Abound, Pristine or Flint
- Use enough water for adequate coverage
- ALWAYS READ AND FOLLOW THE LABEL!!

Bill Cline; NCSU

Recommended Spray Schedule for Control of Berry Diseases

Begin fungicide applications at bud break – usually early to mid-May.

Continue applications at 10 – 14 day intervals alternating among three classes of fungicides such as Nova, Abound, and Elite.

It is important to alternate between fungicides with different modes of action to prevent the pathogens from becoming resistant to the fungicides.

Apply fungicides at a 10 day interval during rainy periods and at a 14 day interval during dry periods.

Fungicide applications may be discontinued two months before harvest.

If muscadines are being grown for juice it is not necessary to apply any fungicides to most cultivars because the berry rots are not severe enough to effect their yield or quality.

Barbara Smith; USDA

Critical Periods for Achieving Control of Muscadine Diseases

Bitter Rot	During shoot extension, through bloom, and preharvest.
Black Rot	During shoot extension, through bloom, and from fruit set until fruit is larger than ½ inch diameter.
Ripe Rot	From cap fall until harvest.
Macrophoma Rot	Last 6 weeks prior to harvest, especially 14 to 7 days before harvest, and immediately after a harvest but within the PHI before the next harvest.
Angular Leaf Spot	From fruit set through fruit ripening, and possibly after harvest.
Powdery Mildew	From fruit set through first hint of color change.

Chen et al. in Muscadine Grapes; 2001.

Efficacy of selected fungicides against diseases of muscadine grape[1]

Fungicide	PHI (Pre-Harvest Interval)	Mode-of-Action (MOA) Grouping[2]	FRAC code[3]	Bitter rot	Powdery mildew	Ripe rot	Macro-phoma rot	Black rot	Sooty blotch	Dead arm	Angular leaf spot
Myclobutanil (**Rally**)	14 days	G	3	++[2]	++++	NA	+	++++	+++	???	++++
Thiophanate-methyl (**Topsin- M**)	7 days	B	1	++	+++	+	+	+++	+++	++	+++
Wettable Sulfur (**Microthiol** and other trade names)	1 day (re-entry)	Multi-site	M 2	NA	++++	NA	NA	NA	???	NA	NA
Pyraclostrobin + boscalid (**Pristine**)	14 days	C	7+11	+++	++++	++++	+++++	++++	+++++	++	++++
Kresoxim-methyl (**Sovran**)	14 days	C	11	+++	+++	+++	++	+++	+++	++	+++
Azoxystrobin (**Abound**)	14 days	C	11	+++	++++	++++	++++	++++	++++	++	++++
Trifloxystrobin (**Flint**)	14 days	C	11	+++	++++	++++	+++++	++++	+++++	++	+++
Ziram (**Ziram**)	21 days	Multi-site	M 3	++	++	+++	++	+++	+++	++	+++
Captan (**Captan, Captec**)	0 days (72 hrs re-entry)	Multi-site	M 4	++	++	++++	+++	+++	+++	++	+++
EBDCs (includes **Maneb, Manex, Penncozeb, Manzate, Dithane M-45**)	66 days	Multi-site	M 3	+++	++	NA	++	+++	++	++	+++

[1] NA = no significant activity, ??? = unknown activity; + = very limited activity, ++ = limited activity, +++ = moderate activity, ++++ = good activity, +++++ = excellent activity.
[2] Alternation of fungicides with different modes of action helps prevent the development of pest resistance to a particular class of fungicide. There is no benefit to alternating or tank-mixing fungicides with the same mode of action. Fungicides listed as "multi-site" are the least likely to be overcome by a resistant strain of a pathogen.
[3] In addition to MOA grouping, the FRAC code also indicates fungicides that can be alternated to discourage pest resistance; alternate or tank-mix only those products having different FRAC codes.

Nematodes

- Generally not considered to be a problem on muscadines.
- Very limited research.

Crown Gall

- Generally not considered to be as much of a problem as observed in wine grapes.
- Associated with wire rubs and cold damage.

Survey

Occurrence and Distribution of Plant-Parasitic Nematodes on Muscadine Grapes in Georgia and North Carolina

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Abstract

Muscadine grape, *Vitis rotundifolia*, is native to the southeastern United States, but Georgia (GA) and North Carolina (NC) are the largest North American producers. Plant-parasitic nematodes (PPNs) have become a significant factor affecting the health, quality, production, and maintenance of bunch grapes (*V. labrusca*, *V. vinifera*), but little is known about muscadine PPNs. A systematic survey was conducted of PPNs infesting eight and 11 muscadine grape vineyards in GA and NC in August and October 2018, respectively. The most frequently detected PPNs across all samples from both states were *Helicotylenchus* (90%), *Mesocriconema* (72%), and *Xiphinema* (58%). However, 5 *Hemicycliophora* and 710 *Scutellonema* nematodes/100 cm^3 of soil were found only in GA, whereas only 1 *Belonolaimus* nematode/100 cm^3 of soil was found only in NC. Ordination of the nematode communities from the samples collected in GA and NC yielded groupings that aligned with the state of origin. Multivariate tests for group membership indicated that several genera were statistically associated with either NC or GA muscadines, and the PPN communities distinctly differed between states. Because muscadine grapes do not have established nematode thresholds, it is not known whether these nematode species are negatively impacting mature grapes.

Keywords: nematology, small fruits, *Helicotylenchus*, *Mesocriconema*, *Xiphinema*

Pruning wound diseases are also observed in muscadine. The most prevalent dieback disease in GA is caused by *Botryosphaeria dothidia*. Generally thought to be associated with pruning cuts, wire rubs, or broken spurs.

***Botryosphaeria dothidia* also causes the Macrophoma rot of muscadine grapes.**

Current Control Measures

- Following general pruning (Jan-Mar), spray pruning cuts with a compound such as Topsin M or Rally at the end of each day.
- If “dead arm” or “dieback” is observed, cut out the infected arm. Make the cut at least 8 inches below the canker. Sterilize the blades between cuts in a 10% bleach solution. Spray the cut with a fungicide.
- Maintain proper fertility and otherwise healthy vines.

Postharvest Disease Control

- Largely a “black hole” with limited information.
- Low temperatures (between 0° and 3.5 °C) with saturated relative humidity are generally recommended, but saturated conditions increase rots.
- As a general rule, muscadine fruit should be moved to market in refrigerated trucks (4°C) and sold within seven days of harvest.

Postharvest Disease Control

- *Alternaria*, *Aspergillus*, *Botrytis*, *Fusarium*, *Penicillium*, and *Greeneria* (very prevalent in storage) spp. have been reported.
- Torn stem scars are a major source of infection.

Postharvest Disease Control

- Sulfur dioxide generators can be utilized, and they have been – with some success. However, damage to fruit is also possible.
- Ethylene oxide use has also been reported.
- Controlled atmosphere studies have been conducted.
- In general, the lack of research and costs have precluded use of these methods in muscadine grape storage.