



Caring for Backyard Muscadine Vines

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NC STATE UNIVERSITY



Overview

- Muscadines in NC
- Cultivars
- Yields and Vineyard Life
- Site Selection
- Site Preparation
- Trellising
- Planting
- Training
- Pruning
- Vine Nutrition
- Irrigation
- Pest Management



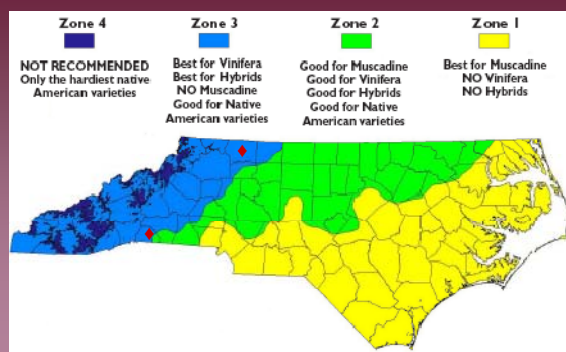
Muscadine Grapes

- Originated in the humid SE US
- Tolerant of intensive rainfall and high humidity
- Resistant to most diseases and nematodes that plague *V. vinifera*
- Cultivated for over 400 years
- Mostly dark-fruited in the wild
 - Bronze-fruited types rarely occur in the wild and are often referred to as "Scuppernongs"
 - Scuppernong is actually a specific cultivar
- 'Scuppernong' was first muscadine brought into cultivation from the wild
 - Discovered around 1760 in NC
 - Unusual bronze-fruited cultivar



Scuppernong

Viticultural Suitability in NC



Commercial Cultivars

- Of the numerous muscadine grape varieties, only a few account for most of the commercial production acreage
- The leading variety, Carlos, represents most of the acreage in NC (>90%)
 - Carlos has excellent yield but breaks bud earliest, and therefore is at risk of damage from late spring cold events



Commercial Cultivars

- The second most important winegrape is Noble
 - Noble is outstanding for its high yields, but is strictly a processing berry due to its small berry size



The best fresh cultivars have:



- Large size
- Uniform color
- Unblemished skin
- Dry stem scar
- Acceptable yield
- Good flavor
- At least 15°Brix
- Edible skin



Slide courtesy Bill Cline

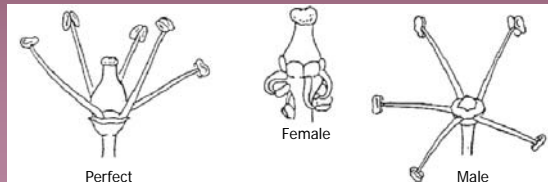
Ornamental Muscadines

- 'Southern Home' stands out for its usefulness as a ornamental
 - Interspecific *V. rotundifolia* and *V. vinifera* hybrid
 - Self-fertile
 - Black berry of medium size, as many as 12 per cluster, and non-muscadine flavor, may be useful in home wine-making
 - Rapidly growing
 - Highly resistant to diseases
 - Known for fig-leaf shape, beautiful foliage color and growth



Female vs. Perfect-Flowered

- Muscadine cultivars may be either female or perfect-flowered
- If a female cultivar is used, a perfect-flowered variety must also be planted in order to assure proper pollination (within 25 ft.)
 - Most of the fresh market varieties are female



Flower at full bloom

Pollination may occur in self-fertile varieties before the cap comes off. This may alleviate pollination problems due to weather.

Pictures from www.plb.ucdavis.edu

The many reasons for poor yield

1. Poor fruit set is a common complaint on backyard vines, but almost unheard of in well-managed commercial vineyards with known cultivars. This suggests that the problem is cultural. A common cause of low yields in backyards is thin, weak growth caused by lack of proper pruning, or by competition from nearby trees. Home vines are often grown on an overhead trellis, and may not be pruned correctly (or at all). Such vines are very productive when young (around years 4-7), but eventually become a mass of thin, unproductive wood due to lack of pruning.
2. Some heirloom vines are low producers. We have been collecting cuttings from old vines at abandoned homestead sites in southeastern NC. Some of these old clones produce very little fruit, even with the best of care. If the vine has been passed down for generations, there is a chance it is inherently low-yielding.
3. Some fungal pathogens (powdery mildew, bitter rot) can attack flowers and fruit at an early stage, causing poor set or fruit drop. Look for a white "haze" on the surface of young berries (powdery mildew), or black spots, streaks, or shriveling of flower clusters and small fruit. Near harvest, bitter rot can also cause drop of large green berries.

The many reasons for poor yield

4. Insects may feed directly on flowers and small berries. Look for Japanese beetles and June beetles feeding on flower clusters.
5. Stink bugs can cause severe fruit drop on muscadines. Developing berries punctured by stink bugs drop off without any obvious injury visible on the surface, but will have one or more dead, brown seeds when cut open in cross-section. Stink bug damage occurs when grapes are sizing but before the seeds harden.
6. Poor pollination can surely occur due to adverse weather, but is rarely reported from commercial vineyards in NC. Dry weather (drought stress) has been implicated in fruit drop on muscadines.
7. Something called 'dry calyptra' has been reported from Georgia on female-flowered vines. The calyptra is the cap that covers the individual flowers, and if it does not fall off, that flower cannot be pollinated (resulting in poor fruit set). This isn't a problem in self-fertile cultivars because they are often pollinated before, or as, the cap is falling off.

The many reasons for poor yield

8. Some cultivars are female-flowered and must have a pollinator in order to set fruit. Unless there just happens to be a wild male vine in the woods nearby, pollination will not occur on a female vine (i.e., no fruit) unless a perfect-flowered cultivar (like 'Carlos' or 'Noble') is planted close by. This is often the culprit when a productive vine stops producing after development removes surrounding woods.

9. Boron deficiency may also result in poor fruit set. Visible symptoms generally do not appear until the vine is critically deficient in this micronutrient, so foliar analysis is important in monitoring boron status (see above for information on NCDA&CS tissue testing). For mature vineyards, a common recommendation has been to apply 5 pounds per acre of Borax (10 percent) every 2 years or spray annually with 1 pound per 100 gallons of water of Solubor (20 percent) just before bloom. For mature backyard vines 2 Tablespoons of Borax can be mixed in with the fertilizer and spread over a 20 ft x 20 ft square around each vine every 2 to 3 years, before bloom. Boron deficiency is more likely on sandy soils with high pH. Excessive boron causes injury; do not exceed boron recommendations.

From musc-mg 4.3 (May 15, 2008) available online at:
<http://www.ces.ncsu.edu/muscadines/muscadine/Musc-mg/musc-mgVol4No3.html>

Yields and Vineyard Life

- Muscadines are generally very productive
- Potential for 2 bushels per vine
- Or, 1 bushel per 10 foot arm!

some fruit in 2nd year



- It is not unusual for a muscadine planting to produce for more than 30 years with good pruning, spraying, and a well-constructed trellis



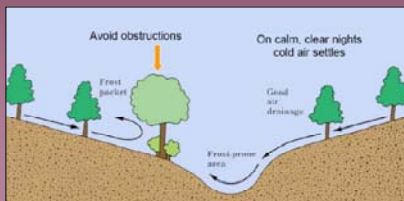
Site Selection

- The most critical consideration in choosing a planting site for muscadines is internal soil drainage
- Although wild muscadines survive on a wide variety of soils, you must select a well drained soil for optimal growth and yield
- Water should not stand on the site after a normal rain, and the subsoil should not restrict drainage



Site Selection

- Vines should be planted at least 50 feet away from woods or other obstructions and not planted at the bottom of a slope
 - Unobstructed locations allow air to drain away from the vines on cold nights



Site Preparation

- Collect a soil sample and submit to NCDA&CS through your local Extension Office
- Follow recommendations you receive on the soil test report to add fertilizer as needed and dolomitic lime to bring the pH to 6.5
 - Incorporate well before installing trellis or planting vines
- Subsoil if necessary to break up hardpan



Trellising

- Decide on the trellis system and complete the construction before planting
- A practical system allows for establishing permanent cordons (arms) that can be easily reached for the required annual pruning
- This requires training of the cordons to single strands of wire
 - No. 9 wire is recommended

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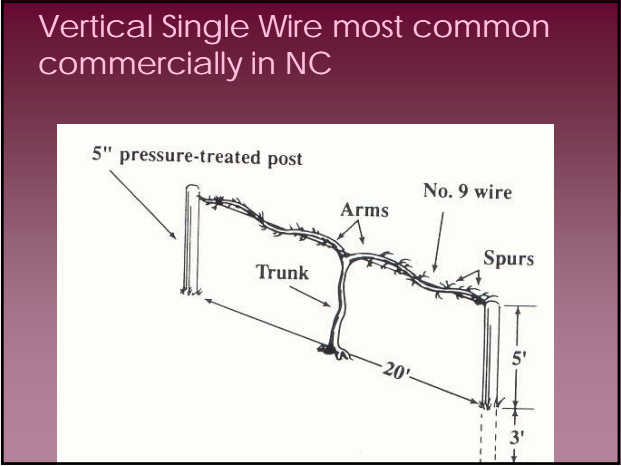
Trellising

- A single wire 5 to 6 feet above the ground and well anchored on each end is the easiest trellis to construct and maintain
- Four-foot cross arms of 2 x 6 inch treated lumber can be attached to treated posts to support the Geneva Double Curtain trellis
 - The GDC system will yield about 30% more than the single-wire system

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Vertical Single Wire most common commercially in NC

The diagram illustrates a vertical single wire fence system. It features a 5" pressure-treated post on the left, connected to a 20' trunk. The trunk is supported by a No. 9 wire. The system includes arms and spurs. The dimensions shown are 5' and 3'.

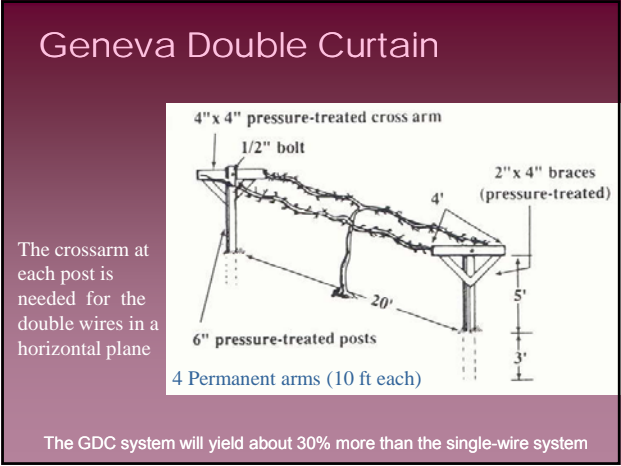


Geneva Double Curtain

The crossarm at each post is needed for the double wires in a horizontal plane

4 Permanent arms (10 ft each)

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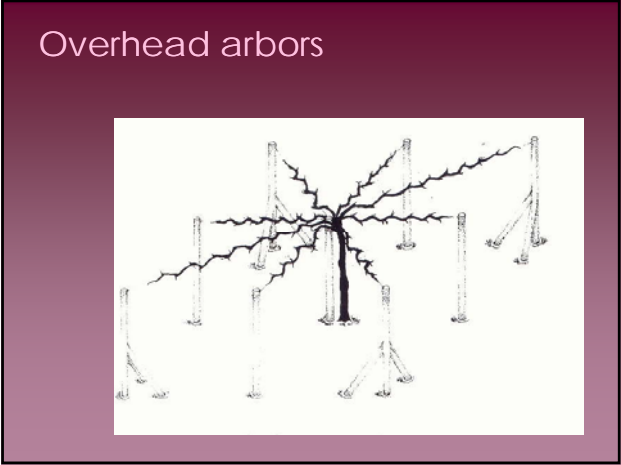
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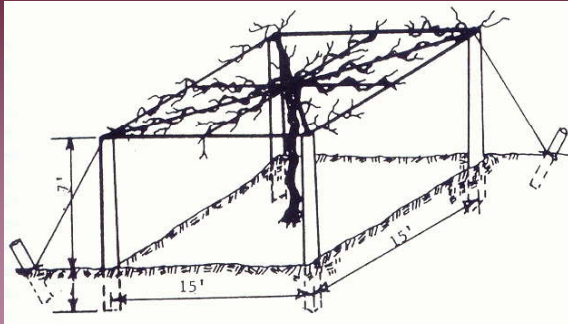
- Vines should be placed ~18 inches from the post
 - If placed between the two posts the trunk will bow with the weight of a mature crop and additional posts may need to be added
- 
- A photograph of a vineyard showing a vine trunk bowing significantly between two metal posts, illustrating the need for additional support. The vine is dark and thick, and the bowing is pronounced, causing it to droop. The surrounding area is green with grass and other vines, and a red circle highlights the bowed section of the trunk.



Overhead arbors

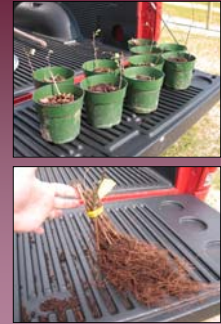


North Carolina System



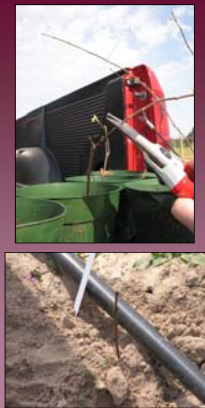
Planting

- Wait until there is little chance of sub-freezing temperatures before spring planting
- Potted plants are easier to hold until the proper planting time, but bare-root plants are satisfactory if the roots are kept moist (not wet), and the plants are refrigerated until planting time



Planting

- Prune back to 2 buds
- Plant at the same depth or slightly deeper than the previous planting depth
- Vines should be a minimum of 10 feet apart in the row, but more desirably, 20 feet apart
- Distance between rows can depend on the equipment used for mowing, but 8 feet should be a minimum

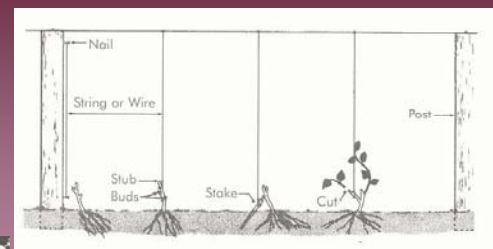


Training

- When new growth begins, select the most vigorous shoot and cut away the others
- A bamboo training stake beside the plant is convenient for attaching the growing vine
- Loosely tie the shoot to the stake with materials that will stretch or degrade so as not to girdle the growing vine
 - Max Tapener used in picture



Training in First Year



AG-94



Do not attach string to the developing trunk as it will eventually girdle it.

Training

- Continue tying the vine each week and removing side shoots
- When the vine is ~6-8 inches above the wire, cut the growing tip ~6 inches below the wire to force lateral buds
- Shoots from the lateral buds should be trained down the wire to form the cordons, just as the trunk was trained up the stake



Training

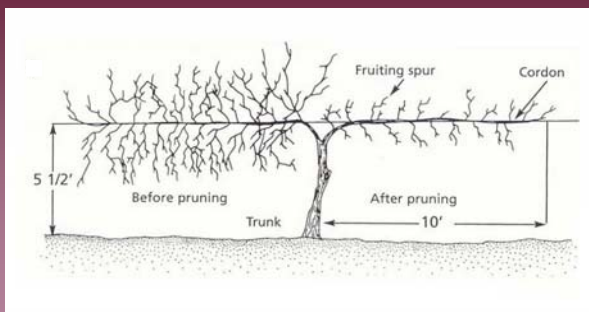
- The goal should be to get the vine on the wire the first growing season and to full length in the second season
- After the cordon has developed to full length, side shoots can be allowed to develop
 - These side shoots should be cut back to 2 to 3 buds during the dormant season
- The next season, the buds on these side shoots will develop into shoots that produce flowers and fruit
- Each dormant season, the lateral shoots must be cut back to 2 to 3 buds by hand or with a hedge trimmer

Pruning

Pruning Neglected Vines?
See AG-94, Muscadine Grape Production Guide for NC



Before and After



Best time to prune?

You will see less
"bleeding" from
pruning cuts in
Dec-Jan-early Feb

Bleeding from
pruning cuts will
not harm the vine



Basic Tools Needed



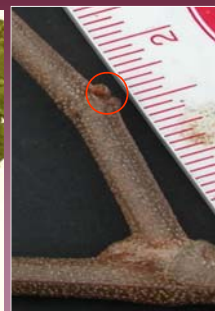
Use loppers for heavier cuts on the permanent arm



Bud forms in leaf axil



Growing season



Dormant season

New shoot (early May)



Weak (top) vs. healthy (bottom) 1 year wood



Close-up 1 year wood (cane)

Definition:

Cane – growth of the current season or shoots that have become woody



1 year wood and buds

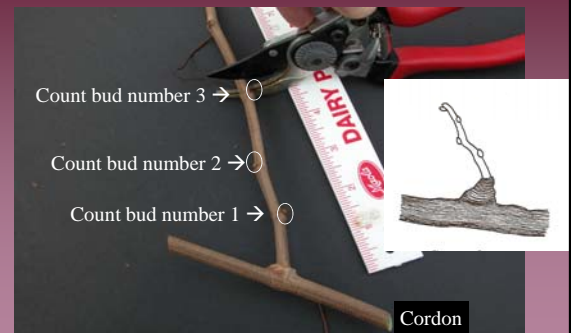


1st winter – prune back to just 1 bud

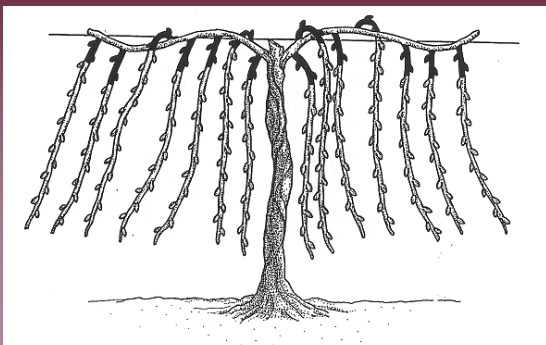


Still trying to establish cordon. If cordon is full-length, can leave longer spurs.

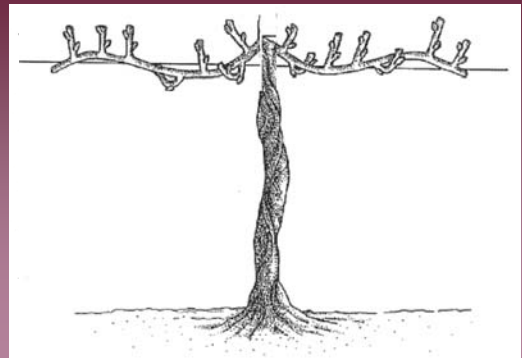
From year 2 on, leave a 4-inch spur (2-3 buds) every 4-6 inches



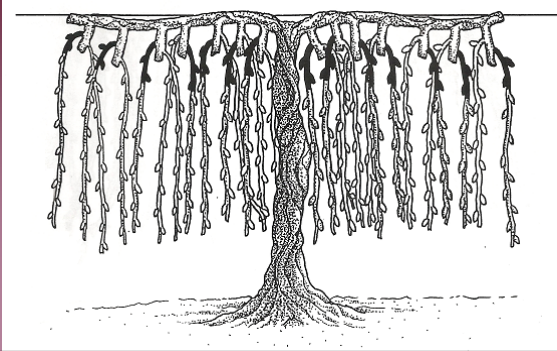
Spur pruning, 3rd winter before pruning (black-colored canes will be retained for next season's fruiting wood)



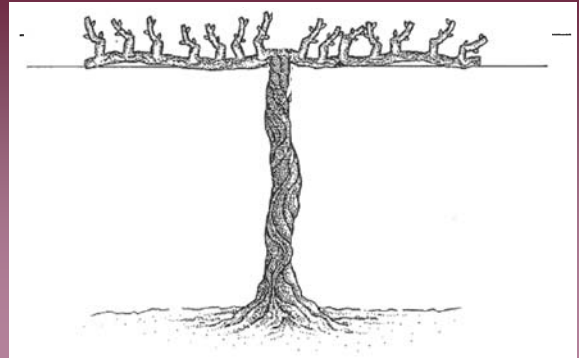
Spur pruning, 3rd winter after pruning



Spur pruning, 4th winter before pruning (black-colored canes will be retained for next season's fruiting wood)



Spur pruning, 4th winter after pruning



Using hedgers to pruning away unwanted 1 year wood, and to "shape the vine" so that the zone of fruitful 1 year wood is inside the imaginary circles on each arm



Pruning away excess 1 year wood

Benefits of hand pruning

- Encourages base and latent buds to break
- Useful for keeping fruiting wood close to cordon

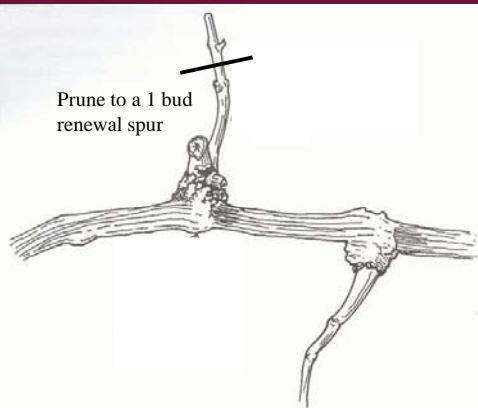


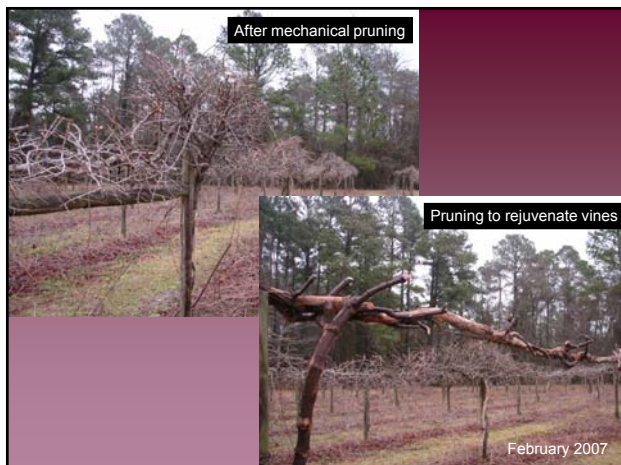
Cordon of a healthy 5 year old vine – each year the 1 year 'fruiting spurs' move further from the cordon

Older vine with less fruitful "bearers"



Prune to a 1 bud renewal spur





Vine Nutrition

- Generally, apply $\frac{1}{4}$ lb of 10-10-10 in an 18-inch circle around each vine beginning 2 weeks after planting (late April-early May) and repeat every 6 weeks until early July
- During the second year, apply in early March, May and July at double the first year's rate ($\frac{1}{2}$ lb per vine)
 - Do not put the fertilizer closer than 21 inches from the trunk
- In the third year use a rate of $\frac{1}{2}$ pound per vine at the same intervals
- To minimize the potential for winter cold injury, growers should not apply fertilizer after the first week in July since this may lead to winter damage and possibly crown gall

Alternative Fertilizer Regime

- In eastern NC, an alternative fertilizer to 10-10-10 that shows promise involves the application of 6-6-18 tobacco fertilizer because it contains several micronutrients in addition to N, P, and K
- It should be applied in March and then again in late June, at $\frac{1}{4}$ lb per vine after planting and $\frac{1}{2}$ lb per vine in the second year
- Mature vines should receive 2 to 3 lb at each application
- An application of calcium nitrate should also be applied in mid-May at 6 to 7 oz per vine
- Leaf samples can be taken to determine the actual nutritional status of mature vines

Irrigation

- Muscadine grapes are quite drought tolerant
- Water is essential during dry periods the first two years, then the vines can usually obtain adequate water from the soil even during dry periods
- Most commercial growers continue to use irrigation to maximize yields
- You can tell when a vine needs water because the leaves and tendrils will droop

Pest Management

- Weeds can compete with vines for water and nutrients and should therefore be managed, especially during establishment



Commercial growers are encouraged to maintain a 3-ft wide weed-free strip under their vines to reduce competition for water and nutrients

Muscadine Grapes are Sensitive to Herbicide Drift Damage

- Grapes are very sensitive to 2,4-D and dicamba drift



Pests During Establishment

- During the 2-3 years required for establishment, few insects or diseases are usually encountered
- However, Japanese beetles can be a fairly severe problem
 - They normally feed over a 4- to 6-week period – spray as needed
- Japanese beetles feed on grass roots and may emerge in large numbers on land that was previously a well-established pasture



Pests During Establishment

- Symptoms of black rot may appear on the leaves of muscadines during the establishment period, but since no fruit is usually present and infections are not usually severe, sprays are not usually necessary



Diseases of Mature Vines

- Major diseases of muscadine grapes include angular leaf spot, bitter rot, powdery mildew, ripe rot, macrophoma rot, and black rot



Angular leaf spot

Diseases of Mature Vines



Bitter rot



Powdery mildew

Diseases of Mature Vines



Ripe rot



Macrophoma rot



Black rot

Pierce's Disease

- A bacterial pathogen transmitted by leafhoppers such as the glassy-winged sharpshooter
- The cultivar Pride is highly susceptible and may be killed by the bacterium
- Growers should avoid propagating from symptomatic vines
- Chemical control is not available



Pierce's disease causes a marginal leaf burn on susceptible cultivars such as Carlos

Crown Gall

- Crown gall is caused by a bacterium frequently associated with gall formation on grape vines
- Galls are fleshy, irregularly shaped growths
- The disease usually occurs in association with freeze injury, and galls may form all along the length of the trunk and cordons
- Fall planting exposes new vines to freeze injury and should be avoided



Reduce Disease Through Cultural Practices

- Cultural Practices
 - Mowing or otherwise reducing undergrowth near vines will improve air movement through the vineyard
 - Timely harvesting and removal of leftover fruit at the end of the season helps reduce fruit rots
 - Avoid excessive late-season fertilizing to reduce disease and the likelihood of winter injury to cordons and trunks of vines

Fungicide Control of Major Diseases

- Fungicides
 - A regular spray program is often not necessary in the backyard garden
 - Won't need to begin the disease control spray program until the second or third season after planting (because you won't have any fruit)
 - If necessary, repeated early season applications of fungicides (May-June-July) are more effective than treating after you see disease on leaves or fruit

Table 6. Fungicide Effectiveness in Control of Grape Diseases*

Fungicide (Rate/Acre)	Angular Leaf Spot	Bitter Rot	Powdery Mildew	Ripe Rot	Macro- phoma Rot	Black Rot	Plant Safety
Captan 50WP (4.0 lb/acre)	XXXX	XXXX	0	XXX	XXX	XXXXX	XXXXX
Wettable Sulfur (4.0 lb/acre)	0	0	XXXXX	0	0	0	XXXX
Nova 40WP (5.0 oz/acre)	0	XXXX	XXXX	0	X	XXXX	XXXXX

*(0 = ineffective or injurious; xxxxx = very effective or very safe)

Potential for Organic Production

- Muscadine grapes can often be grown successfully without insecticides or fungicides
 - Immune to Downy Mildew
 - Immune to Bunch Grape Anthracnose
 - Resistant to Phomopsis
 - Physically tough, thick-skinned
 - Sulfur can be used to control the biggest disease threat, Powdery Mildew

Potential for Organic Production

- Japanese beetles are often the most damaging insects
 - Pheromone traps are one control option
- Selecting cultivars with some disease resistance such as 'Carlos', 'Nesbitt', 'Noble', 'Triumph' or 'Regale' will reduce the losses without pesticide applications

Propagation

- A good way to propagate a few vines at a time is by layering. Layering is also a good method of propagation for varieties that may be hard to root by cuttings.
- *Root Layering* - The simplest way of layering is to bend a healthy shoot down to the ground and bury a portion of it, leaving the tip end exposed (you can use a brick to hold it in place). After the vine goes dormant in the fall, the shoot can be dug and cut into rooted sections.



Propagation by Layering

- *Air layering* – Air layering of muscadines involves a plastic soda bottle attached to the trellis wire.
- Air layering is best accomplished when the vine is actively growing (May to August, as with cuttings).
- First, cut off the bottom of a plastic soda bottle.
- Leave the shoot attached to the parent vine, and thread the growing point through the cut end of the bottle and out through the cap-end opening.
- Scarring the shoot seems to help the air layering process; use a pocket knife to scrape down one side of the shoot to the cambium along the section that will be submerged in the mix.

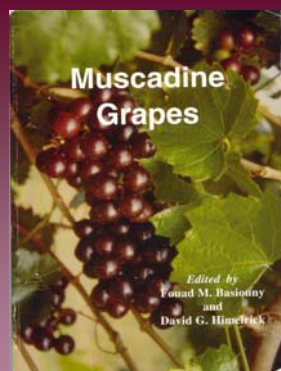


Propagation by Layering

- Fill the bottle with a pine bark propagation mix (1:1:1 mix of peat:sand:bark), and wet with room temperature water.
- Rainwater usually suffices to keep the mix wet, but check occasionally and hand-water as needed.
- After the vine goes dormant in the fall, remove the shoot from the parent vine and cut into rooted sections.
- These can then be potted or stored bare-root in a refrigerated area (40-45 °F) to await planting the following spring.



"Air layering" with plastic soda bottles. By fall, roots can be seen at the edge of the bottle.



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For Further Information

- Contact your local Horticulture Extension Agent

Online Resources

- Southern Region Small Fruit Consortium
www.smallfruits.org
- NC Muscadine Grape Association
www.ncmuscadine.org
- Connie Fisk, connie_fisk@ncsu.edu
<http://www.ces.ncsu.edu/muscadines>