

#### SRSFC Sponsored Insect and Disease Identification and Management for Small Fruit

November 8-9, 2011

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2 Agenda
3 Basics of organics
44 Organic Strawberry Production
140 Organic Blueberry Production
181 Organic Bramble Production
222 Organic Muscadine Production
Organic Winegrape Production

266 ......Organic wine grape production in the mid-Atlantic regions??

300 ...... Organic Winegrape Production in NC Our Experience

323 ...... Resources

# SRSFC Sponsored Organic Small Fruit Training for County Extension Agents November 8-9, 2011

#### In conjunction with the 2011 Strawberry Expo Sheraton Imperial Hotel, Research Triangle Park, NC

#### Tuesday, November 8, 2011

#### **Moderator-Heather Barnes, NCDA**

7:30-8:30 a.m.	Coffee and biscuits in exhibit area-breakfast on your own
8:30-9:00 a.m.	Sign in and receive handouts
9:00- 11:00 a.m.	Basics of organics-Tony Kleese, Earthwise Company
11:00 -11:15 a.m	Break in strawberry Expo exhibit area
11:15-12:15 p.m.	Organic Strawberry Production-John Vollmer, Vollmer Farm, Bunn, NC <a href="http://vollmerfarm.com/">http://vollmerfarm.com/</a>

12:15 p.m.-1:15 p.m. Sponsored Lunch in meeting room

#### **Moderator-Allen Straw, VA Tech**

1:15-2:15 p.m.	Organic Blueberry Production-Gerard Krewer, Professor Emeritus, Univ of GA Harrietts Bluff Organic Farm, Woodbine, GA
2:15-3:15 p.m	Organic Bramble Production-Gina Fernandez, Professor, Hort Sci, NC State
3:15-3:30 p.m.	Sponsored Break in meeting room
3:30-4:30 p.m.	Organic Muscadine Production_Bill Cline, Extension Associate, Plant Path, and Terry Bland, Research Technician, Hort Sci, NC State
4:30-5:30 p.m.	Organic Winegrape Production- Mizuho Nita, VA Tech and Clyde and Pat Colwell, Carolina Heritage Vineyard and Winery, Elkin, NC <a href="https://www.carolinaheritagevineyards.com">www.carolinaheritagevineyards.com</a>
6:00 p.m.	Dinner on your own

#### Wednesday, November 9, 2011

7:30 a.m.	Depart Hotel by charter bus for Vollmer farm-tour of organic strawberry, blueberry and blackberry plantings with extension specialists Gina Fernandez(blackberries, raspberries), Bill Cline(blueberries, muscadine grapes), Terry Bland(blueberries, muscadine grapes), Katie Jennings(weed management), Gerard Krewer (blueberries, blackberries), Frank Louws(strawberries). Mizuho Nita(winegrapes), Alan Straw(strawberries)
12:00 p.m.	Sponsored Lunch

2:00 p.m. Arrive at Hotel and Depart for Home





# Introduction to Organic Production and Certification

Tony Kleese
Organic Farm and Certification Consultant
www.earthwiselife.com

# The Basis for National Standards

- 1990 Organic Foods Production Act part of the 1990 Farm Bill.
- 1992 USDA appoints National Organic Standards Board (NOSB).
- 1996 NOSB completes recommendations.
- 1997 USDA publishes first proposed rule
- March, 2000 USDA's 2nd proposed rule
- December, 2000 USDA's Final Rule
- October 21, 2002 Implementation

# Organic Production

"A production system that is managed to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity."

## Who must be certified?

Anyone who uses the word organic in selling and marketing organic food and fiber products

#### **Exceptions:**

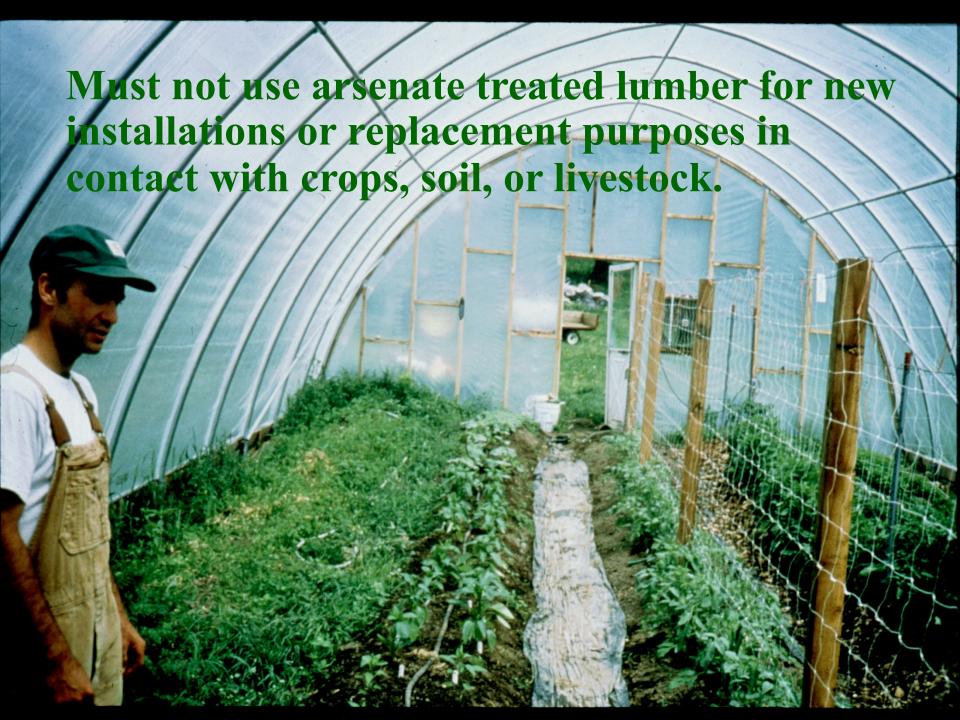
- Organic farmers and handlers who sell under \$5,000/year of organic products.
- Retailers
- Handlers who use the word "organic" only on the ingredient panel
- Handlers, such as warehouses, that do not re-package organic products

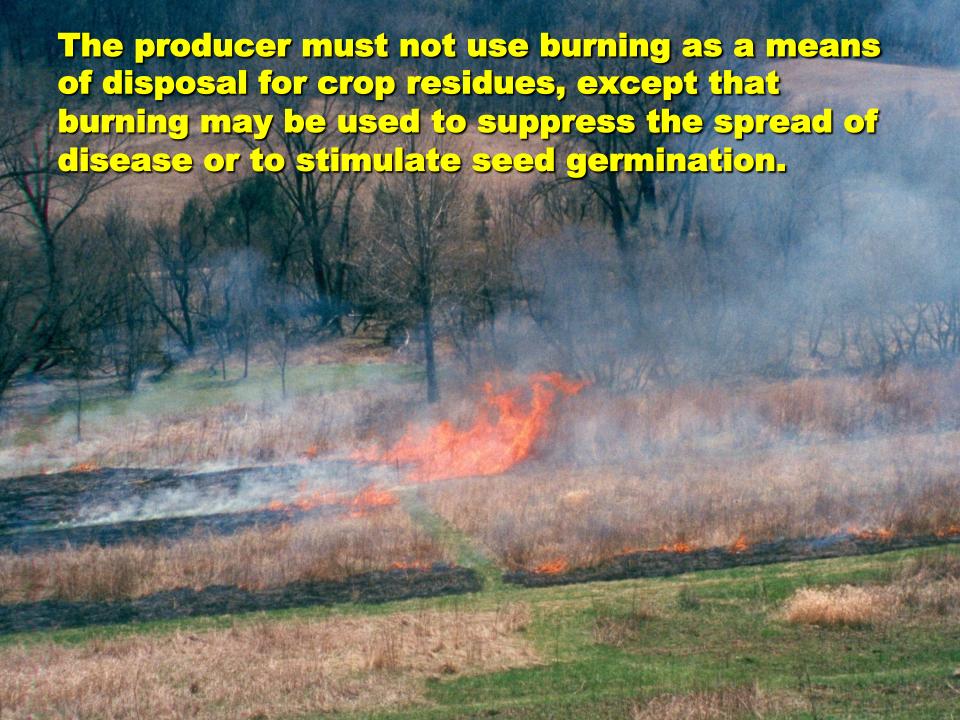
# What is Certified Organic?

- Application of Consistent Production and Handling Standards.
- Development of a Mandatory Organic System Plan, including proactive strategies to prevent problems.
- Use of only Approved Substances.
- Mandatory Verification Through Certification and On-Site Inspection.









#### **Residue Analysis**

- Residue levels must not exceed 5% of the United States Environmental Protection Agency's tolerance level for the specific substance.
- No tolerance levels yet established for GMO contamination.



### **NOP Basic Crop Requirements**

Organic System Plan.

Monitoring of management practices.

 Can have split operation but must have physical barriers to prevent commingling and contamination.

#### **NOP Crop Land Requirements**

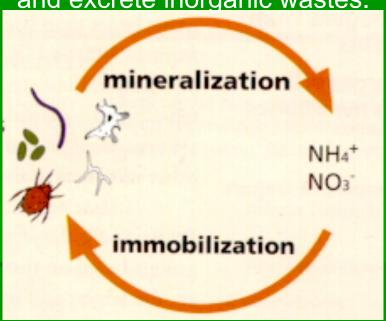
- Land must have distinct, defined boundaries.
- Land must be free of prohibited materials for 3 years (36 months) prior to harvest.
- Must maintain or improve the physical, chemical, and biological condition of the soil and minimize soil erosion.
- Fertility management must not contaminate crops, soil, or water with plant nutrients, pathogenic organisms, heavy metals, or prohibited substances.



# Mineralization and Immobilization

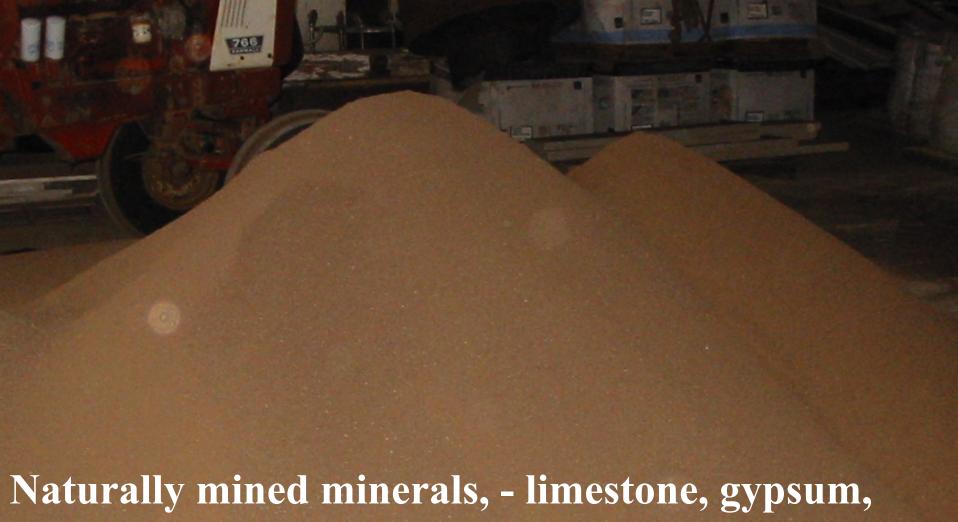
Organisms consume other organisms and excrete inorganic wastes.

Organic nutrients are stored in soil organisms and organic matter.



Inorganic nutrients are usable by plants, and are mobile in soil.

Organisms take up and retain nutrients as they grow.



Naturally mined minerals, - limestone, gypsum, black rock phosphate, etc. are allowed. All other fertility inputs must appear on the National List of Allowed and Prohibited Substances.

### COMMON COVER CROPS

#### Cool Season

- rye, oats, wheat, field pea, hairy vetch, crimson clover
  - Warm Season
  - buckwheat, sorghum-Sudangrass, Japanese millet
    - cowpea, soybean
    - Whole Season / Perennial
    - clovers, alfalfa, mixed grass hay

Composted plant and animal materials are allowed. Uncomposted plant materials are allowed.

Raw manure must be applied at least 120 days prior to harvest of crops for human consumption which may have contact with the soil (or at least 90 days for crops which do not contact soil).



### **NOP Seed Requirements**

- Must use organic seeds, if they are commercially available.
- May use untreated seeds if organic seeds are not commercially available.
- Must not use fungicide treated or genetically engineered (excluded method) seeds.



# Pest and Disease Management

Soil Health

**Crop rotation** 

Sanitation

Plant variety selection

Mechanical/physical

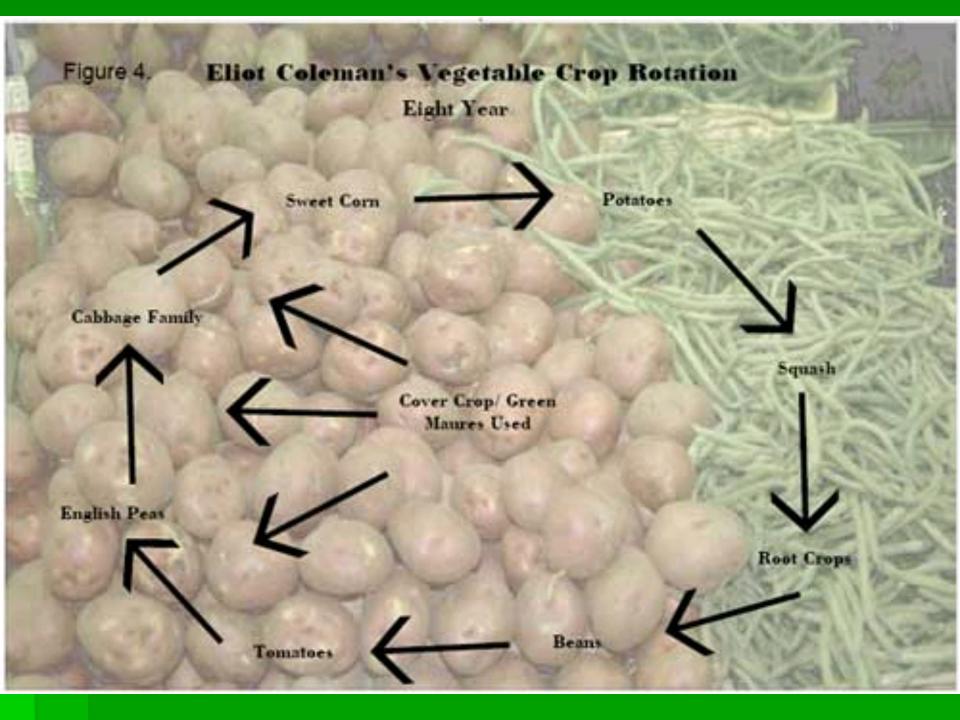
**Predators/parasites** 

Natural habitat development

Lures, traps and repellents

Non-synthetic biological, botanical or mineral inputs.





# **Farmscaping**

"Farmscaping" is the strategic cultivation and placement of flowering plants, hedgerows, etc. to attract beneficial predatory insects.



#### Farmscaping will attract beneficial



 Once your farmscaping gets going, look for ladybugs, lacewings, and pirate bugs, plus parasitic wasps, syrphid flies, and other beneficials.

### **NOP Basic Crop Requirements**

May only use non-synthetic biological, botanical, or mineral inputs or substances on the National List for pest, weed, or disease control when other practices are insufficient.

# Look for these symbols

















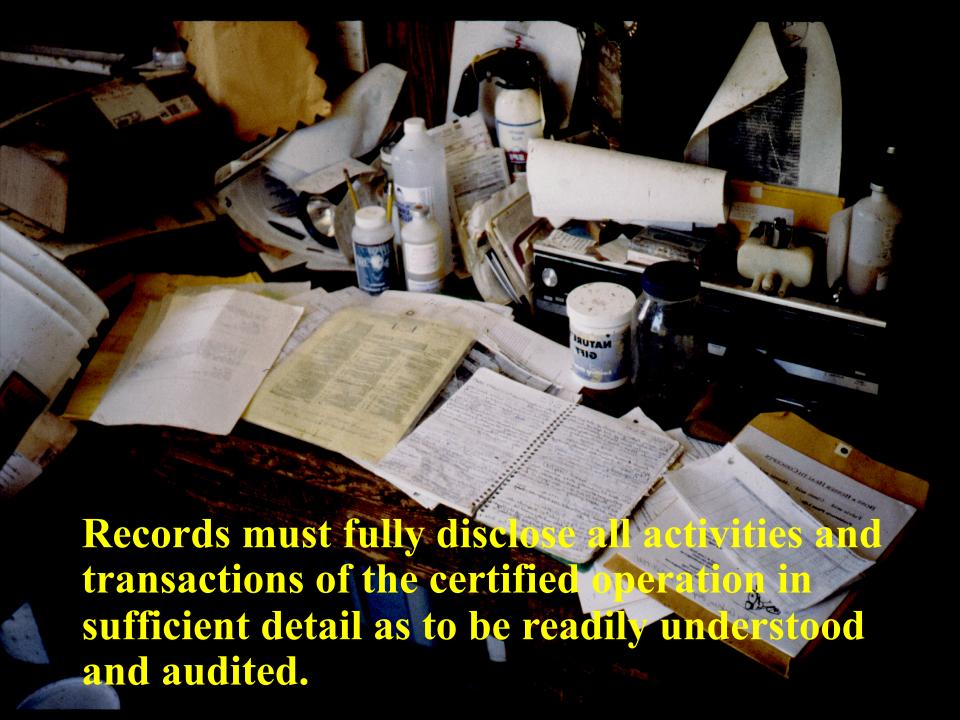












# Steps in the Certification Process

- Pick a certifier
- Get the application
- Fill out the application
- Submit the application with applicable fees
- Certifier does first review and requests missing info
- Certifier assigns inspector
- Inspector conducts on farm inspection
- Inspector submits report to the certifier
- Certifier does second review
- Certificate issued

### How much does it cost?

- Fee schedules vary by certifier
- Budget \$500 to \$1000 per year
- 75 % (up to \$750) cost share available through your State Dept of AG
- EQIP funds available for transition

### **Violations**

Any certified operation that makes a false statement or knowingly sells or labels a product as organic that is not produced in accordance with the Organic Foods Production Act of 1990 shall be subject to up to \$10,000 fine per violation.

### **USDA** Seal



# Organic Strawberry Production Southeast Strawberry Expo Southern Small Fruit Consortium Durham, North Carolina November 8, 2011



John Vollmer "Farmer John" Bunn, NC

Pick your own fun!

<u>www.vollmerfarm.com</u>

### **Two Operations:**

# Spring/Summer-production oriented

- Operated by John & Betty
- 7 acres of Certified Organic Strawberries
- Organic Baby Greens
- 3 acre Organic Vegetable Garden
- CSA Goal 250 members 2012
- Organic Blueberries
- Organic Blackberries
- Farm Market / Ice Cream Shop –Russ
- Weekend Farmer's Markets





### **Fall Harvest Season**

# School Tours Weekend Family Fun

- Owned & operated by Russ
- Russ employed full time off farm
- Market & Ice Cream Shop
- Educational Tours
- Back Forty family play area
- Pumpkins & PYO
- Corporate/Company Picnics





### Farm Market & Ice Cream Shop





## The Back Forty

- •\$13 admission fee per person-includes all activities, does not include pumpkins or food!
- •Open on fall weekends to the general public
- Open weekdays in fall for educational tours











### **CSA Packing Shed**





# **Blackberries & Blueberries**



### Types of Strawberry Production Systems

- Matted Row Bare Ground Biennial
  - Plant April/May 2011
  - Harvest 2012 and beyond
- Plastic Mulch Plus Drip Irrigation Biennial
  - Plant April/May 2011
  - Harvest 2012 and beyond
- Plastic Mulch Plus Drip Irrigation Annual
  - Plant September/October 2010
  - Harvest 2011



### **Cover Crops**

Winter: Crimson Clover – 20 lbs.

Oats – 32 lbs.

**Summer:** Soybeans – 60 lbs.

Pearl Millet – 30 lbs.



### **Cover Crop Benefits**

- Legume Fix Nitrogen + Soil Life
  Grass + Soil Life
- Organic Matter 1
- Water Holding Capacity
- Soil Easy to Work
- Competition to Weeds
- CFC 1
- No Liming Mineral Balance
- Disease + Insects ↓











### Summer Cover Crop

Pearl Millet @ 30 lbs.

Soybeans @ 60 lbs.

Organic/Untreated

Seed by May 15

Grow for 60 days

Flail Mow/Disc by Late July

Land Prep for Berries Starts August 1



### **Organic Strawberry Fertility**

- •Timing August 1-15
- •Adjust pH 6.0-6.5
- •Apply Compost 10-15 yd³/acre
- Apply Nature Safe
  - •8-5-5 @ 800 lbs.
  - •13-0-0 @ 400 lbs.
- Apply Allganic Sulphate of Potash
  - •0-0-52 @ 200 lbs.
  - •w/200 lbs. Gypsum-Extender
- •N = 116 P = 40 K = 144
- •Cost = \$700.00/acre
- •Cover Crops = \$200.00/acre





**Distributed by Southern States** 

### **Derived From**

Hydrolyzed feather meal, meat meal and blood meal.

\*This product contains 12.04% Slow Release Nitrogen from hydrolyzed feather meal and meat meal.



### Directions for Use

This fertilizer is to be used to blend with other fertilizer ingredients. For best results, formulate 13-0-0 at 5000 formulate 13-0-0 at 50% or greater of the total weight of the blend.

Organic Farming:

Formulation | 50 lbs. N/A | 100 lbs N/A | 150 lbs. N/A | 200 lbs. N/A | 538 lbs.















### **Variety Selection**

#### Chandler

- •Best All Round Above 36° Lat.
- •Large Plant 15k...2 rows per bed
- Good Flavor
- •Soft Fruit Odd Shapes



#### **Sweet Charlie**

- •Early (+2 weeks)
- •Small Plant 23k...3 rows per bed
- •Fruity Flavor Low Acidity
- •Soft Fruit "Orangey" Color



#### Camarosa

- •Needs Warm Temperature
- •Large Plant 15k...2 rows per bed
- •Good Flavor Full Red
- Good Shelf Life



#### **Albion**

- •Early Late
- •Small Plant 23k...3 rows per bed
- Good Flavor
- •Firm Fruit
- Beautiful Shape and Color





## IMPORTANT POLICY REMINDER STRAWBERRY PLANTING MATERIALS

Dear Organic Growers:

QCS would like to remind you of our policy pertaining to the use of strawberry planting stock on your organic farm. This policy is designed to ensure that your farm is in compliance with 205.204 of the National Organic Program Final Rule. Please contact our office if you have any questions regarding this policy, or any other issues regarding organic certification.

## 1. Strawberry Plugs Used for Annual Strawberry Production Must be Certified Organic

Strawberry plugs are runners that have been harvested from the mother plant and rooted in a potting media for further growth, storage, and transportation. All strawberry plugs used for production of an annual strawberry crop must be certified organic. There is no commercial availability exception for strawberry plugs used for annual strawberry production. These are considered "annual seedlings" under the NOP.

# 2. Strawberry Plugs Used for Biennial Strawberry Production, and Bare-root Planting Stock, Must be Certified Organic if Commercially Available

Bare-root strawberry planting stock, and strawberry plugs used for biennial strawberry production, must be certified organic unless an equivalent organic variety is not commercially available. If an equivalent organic variety is not commercially available, you may use nonorganic, untreated planting stock.

If you purchase nonorganic, untreated stock, you must provide QCS with documentation that you attempted to locate an equivalent variety of organic stock from at least three producers of organic strawberry planting stock. You must also obtain a statement from the producer of the planting stock that the stock has been untreated since the time it was harvested from the mother plant. The use of treated planting stock will result in the removal of strawberries from your Product Verification Form and will render your land ineligible for organic certification for three years.

#### Order Plants in Late June / July!

## **Plant Types & Planting**

- Plug
- Bare Root/Fresh Dug
- Cut Off



















Place the Tool Near the End





H<sub>2</sub>O within one hour

7-10 days H₂O

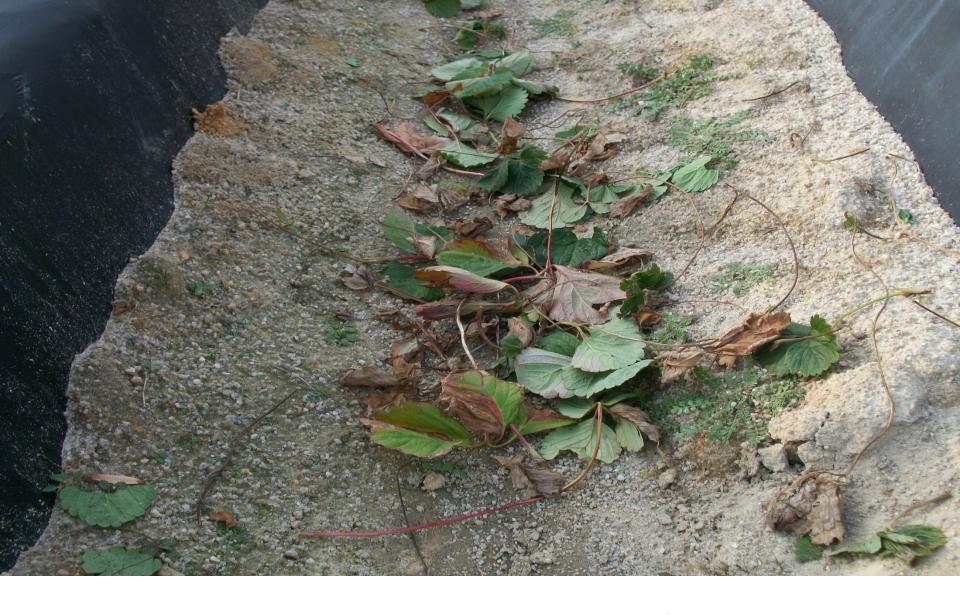






## November-December Clean Up





Weeds, Mites and Disease in the Bottom of the Row - Not Exactly "Priceless!"...labor cost = \$800.00/acre





#### **Purchase Cost**

- •1 oz = \$800/acre
- •1.2 oz = \$1,200/acre
- •1.5 oz = \$1,600/acre

#### Labor

- •Put on Covers = \$150/acre
- •Take Off = \$100/acre









## **Early March Clean Up**

- Dead Blooms
- Dead & Dying Leaves
- Weeds
- Cost = \$400.00/acre
- Scouting for Insects & Disease



## **Frost/Freeze Protection**

#### **Critical Temperatures**

The chart below indicates critical temperatures (degrees F) for cold damage of flower buds based on stage of development

GROWTH STAGE	CRITICAL TEMPERATURE (F)
Bud emergence	10
Tight bud	22
"Popcorn"	26
Open blossom	30
Green fruit	28

Sources: "Strawberry Critical Temperatures" – K. Perry and B.C. Poling, NCSU; and Richard Funt, OSU

#### **Floating Row Cover**

- Useful to small acres
- Limited water Supply

#### **Sprinkler Irrigation**

- Excellent results
- Uses lots of water
- Disease loves this!

**Google: Critical Temperature/Strawberry (for details about protection)** 

## **Fruit Production Stage**

- 3-Day Picking Schedule
- Weekly Scouting
- Tissue Tests 2 weeks
- Weather Forecasts 7-day/hourly
  - Skybit Strawberry Canopy Forecast
  - Accuweather Premium Free Trial
  - Local Stations





## **Common Strawberry Insects**

- Spider Mites
- Aphids
- Lygus Bug
- Strawberry Clipper
- Thrips
- Sap Beetles



**Identify Organic Solutions** 

## Strawberries: Spider Mites



Twospotted spider mites (*Tetranychus urticae*) are the most common economically important pest of strawberries in the southeast

Adult Male and Eggs



**Adult Female** 



**Diapausing Adult Female** 

## Strawberries: Aphids



Aphis gossypii

GPA: Cornicles long, light, if dark, only at tips

Melon aphid:
Cornicles short and dark

Strawberry aphid, knobbed hairs

Chaetosiphon fragaefolii



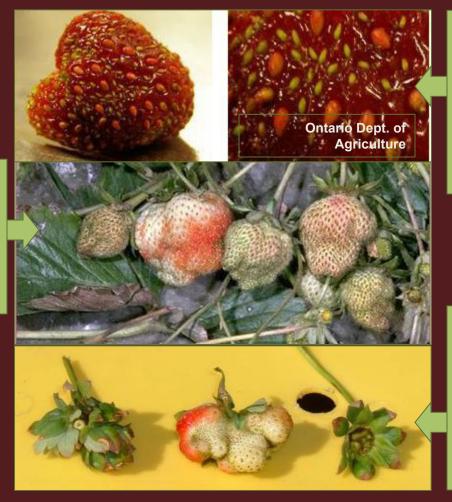


Myzus persicae

Photos: UC IPM Program

## Strawberries: Poor pollination, Lygus bug, or other damage?

Lygus bug: Uniform seed size, evident throughout the fruit



Poor pollination:
Different sized seeds, no brown or hollow seeds

Dried calyx disorder:
Unknown (likely abiotic cause) appears on calyx

## Strawberries: Lygus Bug Biology

#### What Lygus are not:



Tarnished Plant Bug (Lygus lineolaris)



Big Eyed Bug (*Geocoris* spp.)



False Chinch Bug (Nysius raphanus)



## Strawberries: Strawberry Clipper



#### Anthonomus signatus

Small, weevil with multiple generations Feeds on strawberry, caneberry, and wild relatives

## Cutworms, strawberry clipper, or mechanical damage?





Cutworm:
Base of
leaves, crown
are cut.
Preceded by
leaf feeding.
Occurs
primarily in
fall.



Mechanical damage?
Leaves cut in middle/end of stem.
Occurs in fall, winter, early spring.

#### Strawberries: Thrips

- Thrips feeding causes bronzing near the stem on fruit
- Thrips do not cause catfacing
- Threshold = 10/flower
- If bronzing is not observed, do not treat for thrips





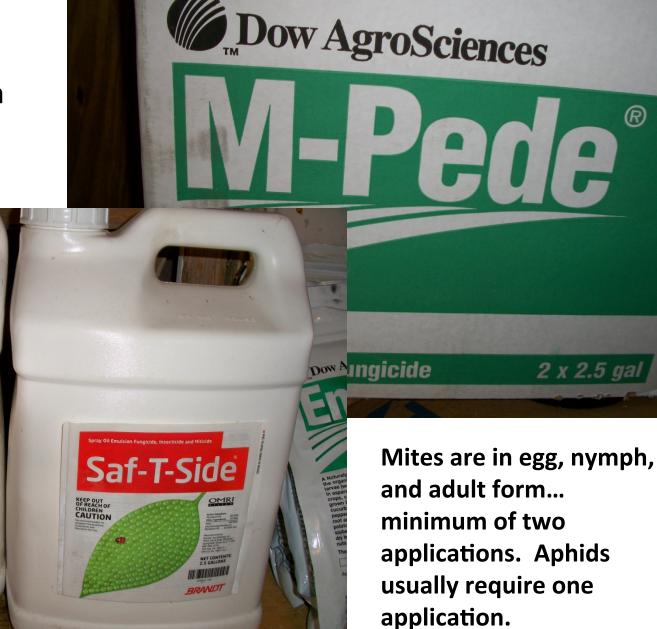
#### Strawberries: Sap Beetle





- Sap beetles feed on over ripe fruit and are attracted to the alcohols produced by the microbes feeding on this fruit
- Can be problematic in peach, plum, and apple production as well
- At least 3 species of ripe fruit feeding beetles are pests of SE strawberries
  - Strawberry sap beetle (Stelidota geminata (Say)), Picnic beetles (Clishchrochilus quadrisignatus or C. fasciatus)

These products cost about \$40/ acre to use per application. High Pressure/High Volume





Broad spectrum control of Lygus, Clipper, Thrips, Sap Beetle and BENEFICIALS!
Consider the use of Neem.

http://www.nysaes.cornell.edu/pp/resourceguide/

#### Fruit Major Diseases

Anthracnose Ripe fruit rot

Minor

∕lajor

Gnomonia fruit rot

Leather fruit rot

Tan brown spot

Miscellaneous fruit rots

#### **Crown and Root Diseases**

Anthracnose crown rot

Phytophthora crown rot

Black root rot

#### **Leaf Diseases**

Angular leaf spot

Common leaf spot

(Mycosphaerella)

Phomopsis leaf blight

Gnomonia leaf blotch

Powdery mildew

Leaf scorch

Phytoplasmas

Red Stele

Southern stem blight

Armillaria root rot

Fusarium wilt

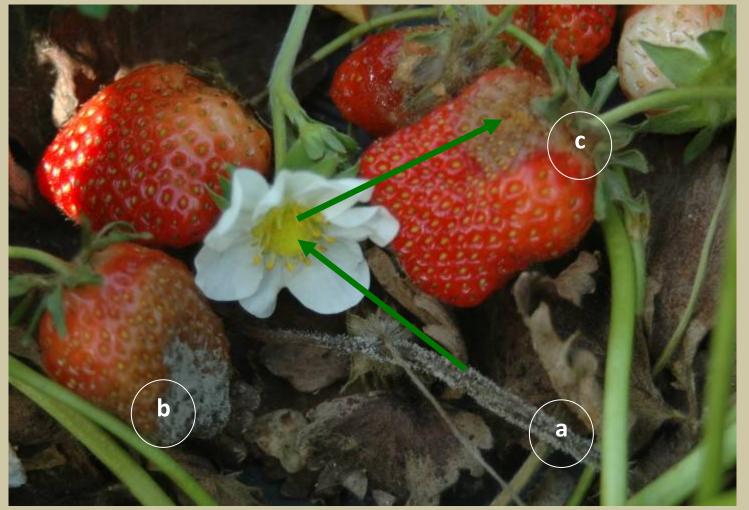
Botrytis crown rot

Nematodes (root knot,

Pratylenchus, Sting)

Dr. Frank Louws & Dr. Mafuzur Rahman - NCSU

#### Botrytis Biology: Gray mold of strawberry



Gray mold on different parts of strawberry; a) Sporulation on dead petiole and leaf; b) fruit infection from colonized dead tissue; c) lesion appearance from internal infection that has occurred through the flower parts such as the stigma.

Infection Cycle of B. cinerea 80 70 Fruit set 60 ☐ Fruit 50 **■** Flower 40 Leaves □ Crown 30 ■ Root 20 Flower development 10 Oct Nov Dec Jan Feb Mar Apr May June Nov / Dec lvs New lvs **Critical time for management Transplant lvs** Feb Oct May Nov Jan Mar Apr Dec

Source of inoculum





Control for Botrytis (gray mold).

Cost = \$25.00/acre per application... multiple applications

or Outdoor Agriculture Production Biological Fungicide Controls/Suppresses soil borne plant diseases such as Pythium, Rhizoctonia, Phytophthora, Verticillium and Fusarium Suppresses and Controls Foliar Disease such as Powdery Mildew, Downy Mildew, Greasy Spot, Botrytis, Sclerotinia, Monilinia, Alternaria, and Erwinia 100% Soluble. Will not clog machinery nd use product contains not less than 1x10 CFU per gram Streptomyces fydious WYEC 108 mation regarding the contents and levels of metals in this product is available on the KEEP OUT OF REACH OF CHILDREN CAUTION See back panel for precautionar US Patent No. 5,403,584 EPA Reg. No.: 73314-1 Contents: 18-oz (504 grams)

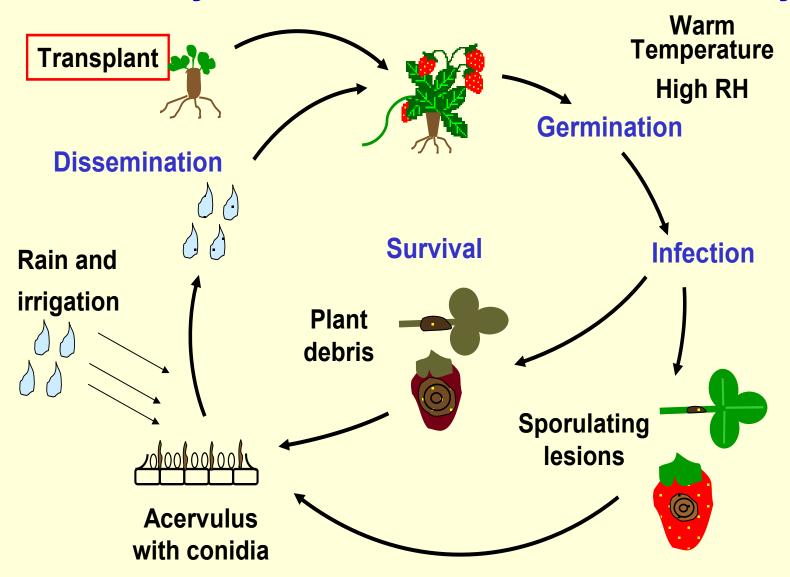
#### IPM-based Management for Gray Mold: (OMRI approved products)

- Manage optimum fertility
- Optimum plant spacing
- Remove dead and dying leaves (never conduct if anthracnose is present)
- •Inspect when covers are removed and spray if necessary.
- •Implement a fungicide program that reduces the risk of disease...14-day schedule (begin at first bloom).
- •Rotate between Serenade and Actinovate to prevent selection of Botrytis populations that are resistant to these fungicides.

#### The Anthracnose Pathogens

Species	Associated Disease Phase	Economic Importance in NC
Colletotrichum acutatum	Fruit rot	High
Colletotrichum gloeosporioides	Crown rot	Low to moderate
Colletotrichum fragariae	Crown rot	Not found since 1986

#### Disease cycle of *C. acutatum* on strawberry



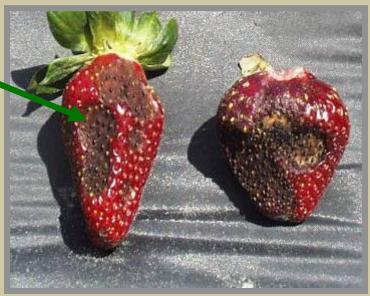
#### Anthracnose

#### Ripe fruit rot/black spot: Colletotrichum acutatum

Symptoms appear as whitish, water soaked lesions (3mm) eventually become sunken and black

#### Crown rot: C. gloeosporioides

Symptoms: Above ground-Plant collapse/wilting and death; Crown-firm, reddish brown/marbled appearance







#### Biology: Anthracnose of Strawberry

- •Infested plants are the main source of disease.
- •NC observations suggest over-summering of the disease does not occur if all infected plants are destroyed after final harvest.
- Infested tips leads to widespread problems in plug houses
- Quiescent infections may be present and spring epidemics occur under favorable conditions
- C. gloeosporioides can originate from wild hosts

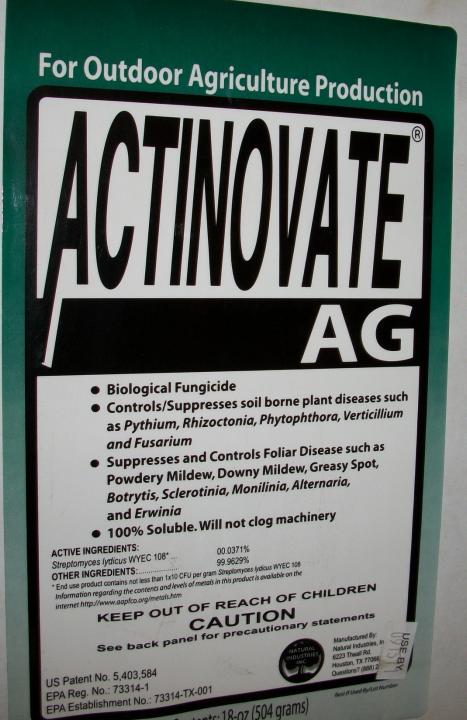
## IPM-based Management for Anthracnose ripe fruit rot:

- Buy disease-free plants (Tissue cultured, certified or grown under similar stringent conditions)
- Immediately rogue out infected plants if small number
- Destroy or bury all infected plants/fruit
- •Use PERpose Plus™ @ 1:100 ratio 3 days in a row
- •Work plants when dry. Rouge diseased plants. Remove diseased fruit. Windborne, splashing rains or irrigation cause widespread innoculation. Harvest infected areas last.



#### Site Selection

- Good soil drainage is critical!
- Areas of standing water will increase the possibility of Phytophthora crown and root rot.



- Drip apply right after planting.
- 6 oz/acre 30
   min. 2x (21 days)
- Cost: \$4.00/oz. x6 oz. = \$24.00/acre
- Albion variety has some resistance.
- Preventative

## ANGULAR LEAFSPOT Xanthomonas fragariae

- has a narrow host range restricted to strawberry
- Distribution: now world-wide probably on infected plants



















## Angular Leaf Spot Remedies (OMRI approved products)

Nordox 75-WG	3-5 lbs./acre	Copper		
Badge X2	.75-1.25 lbs/acre	Copper		
Kocide – No longer OMRI approved				
PERpose Plus	1:100 ratio	Hydrogen Peroxide		



#### **Weed Control**

- ✓ Plastic Mulch very effective
  Straw Mulch middles/not free!
- ✓ Natural Cover middles/mower
- √ Hand Weeding pricey/necessary
- ✓ Weed Eater ends of rows/tape
  OMRI Approved Products ?









Cost: \$500/week x 8 weeks = \$4,000.00



## OMRI Approved Products - ?? You need to know more.



### Notice the absence of fumigation tanks....we are organic!

Motivated by the loss of methyl bromide (fear) as a growing technique for growing strawberries.

Began the process in 1997, first certified in 2000 (3 year process)

Have added other organic crops each year as demand increased....working at this idea for 15 years.

Organic helps separate our farm from others and generates business for our pick-your-own business.







#### In regard to organic,

I personally feel we are delivering a safe product particularly when kids go to the field and "snack" without washing the fruit.

Conventional strawberries are one of the "dirty dozen."

I've had to learn that "yield" is not the total measure of success as a grower.

The safety and nutrition of the product you are delivering to your customer and your own personal satisfaction are new parameters for measuring success.

With organic, you have to be willing to accept the possibility of lower yields, which can be offset by strong demand and high value.

**Farmer John** 





## Who's the NEXT farmer?







# You can do this!



Farmer John Vollmer farmerjohn@vollmerfarm.com 919-495-2392

## Organic Blueberry Production 2011 SR-SFC Agent Training Raleigh, NC

Dr. Gerard Krewer
Professor Emeritus- UGA (gkrewer@uga.edu)
Owner: Harrietts Bluff Organic Farm
Woodbine, Ga.
229-392-1388

#### Topics to be covered

- Site Selection and Establishment
- Cultivar Selection
- Fertilization Programs
- Weed Control Programs
- Insect and Disease Control
- Marketing

#### Disclaimer

- This information is provided for educational purposes.
- Actual experiences may vary.
- It is not warranted in anyway.
- Check with the current pesticide labels and organic regulations before use.
   These can change from year to year.

#### **Preplant Considerations**

Amendment effects and soil chemistry

Irrigation and water chemistry

## Species Organic Matter/ Soil Requirements

- Rabbiteyes: Grow well in mineral soils with moderate organic content (1.5-2% OM)
- Sands, loamy sands, sandy clay loams, clay loams (sandy is better than clay)
- Northern and Southern Highbush: In the South, highbush need high organic matter soil. Min. 3-4% organic matter. Three production systems have been successful (discussed later).

## Organic Amendment Options

- Pine Bark
- Canadian Peat moss- Good but expensive
- White pine wood Too much N tie up for organic, unless you have a lot of preplant time

### **Growing Media Effects on N Release or Tie Up**

- Virgin soil without amendments- low N tie up unless lots of raw organic matter is added in land clearing. Usually a N source.
- Peat moss-?
- Pine bark-High C:N ratio 300:1 (ties up N)
- White wood-V. high C:N ratio of 1000:1 (severe tie up of N)

#### **Pine Bark**

If you incorporate a lot pine bark and plant a short time after this, you will need a lot of additional nitrogen.

# Rabbiteyes-soil organic amendments to help them get started

- If planted on low organic matter, mineral soils, organic matter is usually added to the planting hole (5-10 gallons). Mixed 50/50 with the soil.
- Strip treatment also works well. About two inches of pine bark rototilled into the soil.

# Successful Soils for Highbush

- Three types of growing medias commonly used:
- 1. Virgin spodic sand series without pine bark addition. A layer: high organic matter sand, B layer sand, Bh layer is a hard pan cemented with organic matter and heavy metals.
- Min. of 3% natural organic matter needed,
   5% is better.

### 2. Pine Bark Culture Solo Production

- Widely used in Florida
- Beds of pure pine bark
- Plants grow well, but high fertilizer and water requirements
- Not recommended for organic production

#### 3. Mix of Pine Bark and Soil

- Works well with many well drained soil types
- Less demanding of fertilizer and water than solo pine bark

## **Basic Soil Chemistry Requirements**

- pH 4 to 5.2
- Target is 4.5 to 4.8 use sulfur to lower the pH
- Avoid sites with very high P over 300 pounds per acre
- Avoid high calcium soils unless you are willing to monitor closely and acidify as needed.

# Organic Acidification Options

- Elemental Sulfur-Preplant (as much as needed) and Postplant (300 pounds per acre as needed).
- Natural Citric Acid
- Natural Vinegar?

### Phosphorus Preplant Recommendations (soil or soil-bark mix)

Phosphorus: If soil test indicates less than 20 pounds per acre apply 200 pounds of bone meal. Rototill in.

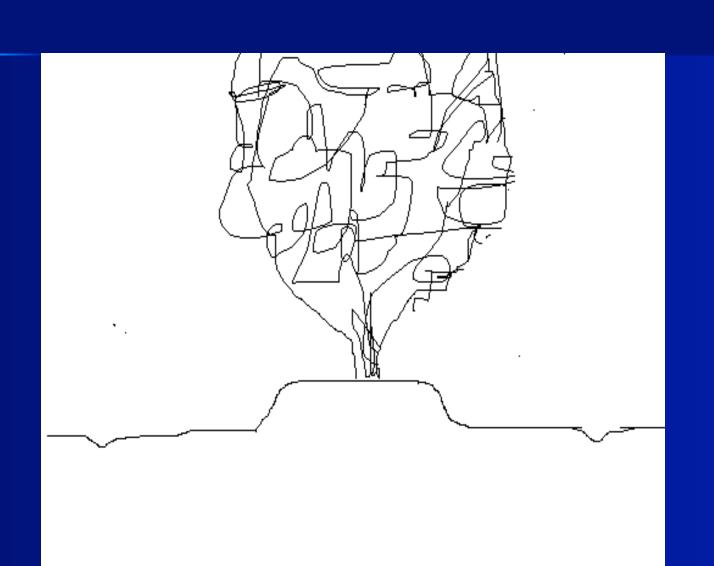
# **Basic Soil Prep For Organic Blueberries**

- Bedding is very beneficial in areas with poor drainage
- Subsoiling is recommended
- Limited options for root rots in organic systems

### Subsoiling

- Beneficial for drainage
- Beneficial on well drained sites with rabbiteyes for deep root penetration

#### Bed with Water Furrow



# **Prepping Plants for Setting**

Many plants are pot bound

#### **Beat out the Root Ball**

Beat out the root ball if pot bound

### **Prep Top**

 Cut to back to 2 or 3 strong canes, remove flower buds

### Weed Control Systems in Organic Blueberry Production

- Course pine bark- Four inches lasts about 2-3 years
- White on black plastic- 1.5 mil lasts about 2-3 years-weed barrier effect
- Woven ground cover-lasts about 4 to 6 years depending on quality
- Wheat straw-Four inches (after settling) lasts one year-significant nutrient source
- Cultivation??

## Management of Bed Edges

- Rolling cultivator or rototiller
- Organic burn now compounds
- Clover oil
- Citrus oil
- Vinegar

### Management of Fence Lines

- Machete
- Propane touch

### **Fertilization Programs**

- General N requirements
- Mature rabbiteyes: 60 pounds of N per year (30 spring -30 postharvest)
- Southern highbush: 90-120 pounds per year
- Generally applied as protein
- Protein is converted to ammonium N

### Phosphorus

Typically 30-60 pounds of P2O5 is needed per year for mature plants.

Rate is based on soil and leaf analysis.

- Can be applied twice a year in soil or in smaller doses during the growing season.
- 8 pounds of P2O5 is needed to raise the P level of the soil by 1 pound
- Typically applied as bone meal for organic production.

#### Potassium

- Typically 60-100 pounds of K20 needed per year for mature plants
- Base rate on soil and leaf analysis.
- Apply in spring and some postharvest
- Natural mined potassium sulfate is the typical source in organic production

### **Magnesium Deficiency**

- Deficiency common in many areas on lower leaves
- Magnesium sulfate can be used to correct the deficiency

### **Common Deficiencies Iron**

- Appears most often at pH above 5.3
- Diagnosis by soil sample and symptoms (leaf analysis not reliable)
- Often seen during droughts on shoot tips using high pH irrigation water or in wet spots.
- Best treated by correcting the pH
- Soil applications of iron sulfate can be use.

### Copper

- Major problem on rabbiteyes on virgin soil
- Small mouse ear shoots in late summer, die back
- Deficiency greatly increases stem blight
- Treat with copper chelate (rate-read label) or copper sulfate 1/2 lbs. injected, 4 lbs. banded
- Use copper chelate if sulfur water is present



# Fertilizer Program I am Using

- Nature Safe 8-5-5 applied every 8 weeks under plastic
- Two applications in spring and two post harvest
- Applied two weeks before more N is needed to allow for break down from protein to ammonium N
- I am using one to three ounces per application depending on bush size

# Fertilizer Program I am using

- Micros injected in drip as documented by deficiencies
- Copper chelate (Biomin-Wash. State organic label)
- Manganese sulfate (OMRI list)
- Borax for Boron (OMRI list)

# Possible Insect and Disease Control Programs

- Dormant season:
- Fire ants-spinosad insecticide, several brands, Conserve and Green Light, etc.
- Scale insects-Certain petroleum oils, check OMRI list

#### **Dormant Season**

Mummy berry- bury mummies with at least ½ inch of soil or cover with mulch

# Late Dormancy (Bud stage 2 and 3)

 Gall midge-attacks swelling flower buds-Spray with spinosad during warm weather if needed

### **Green Tip or 1-5% Bloom**

- Mummy Berry and Botrytis-Serenade plus or Regalia plus NuFilm 17 as sticker
- Apply weekly for a total of three applications

# Late Bloom-Scout for thrips

Thrips- Spinosad insecticide- Entrust, etc.

#### **Near Harvest and Harvest**

- Spotted wing drosophila-Monitor with vinegar or yeast traps, spray with spinosad or Pyganic if needed
- Blueberry Maggot-Monitor with traps, spray with spinosad or use spinosad bait (Naturalyte Fruit Fly Bait)
- Weekly sprays will be needed until infestation stops

### Postharvest leaf spots

- Septoria leaf spot and rust-Fish oils, typically Organic Gem or Omega Grow at 2%
- Compost tea?
- Serenade or Regalia?

### **Postharvest Insect Control**

Blueberry leaf or flea beetle-Spinosad insecticide- Entrust, etc.

### Organic Marketing Options

- You need a good price to make a profit
- U-Pick and Direct Sales at Farm
- Farmers Markets-My experience varies
- Health Food Stores
- CSAs or "Box" Programs
- Wholesale

## Organic blackberry production

SRSFC Agent Training November 8, 2011

Gina Fernandez@ncsu.edu

### A few points to consider...

- Your audience are county extension agents
- The goal of these trainings is to improve the agents ability to provide current and accurate advise to their grower and homeowner clientele.
- They are looking for take home information that can be applied directly.
- Stress approaches, techniques, etc that have worked well in your crops/situation and those that have not worked well.
- Use data to document your points but keep please data presentations at a minimum.

### Site selection

- "tolerant" of heavier soils than raspberries
- pH 6.0-6.5
- High organic matter 3%
- Good air drainage
- Avoid planting into sites previously planted in fruit crops (crown gall)
- Remove wild Rubus from surrounding area (200-1000 ft)
- Don't plant near infected Rubus

### Pre-plant

- Soil preparation/crop rotation
  - No studies specifically for blackberry
  - Improve soil health cover crops, rotation
  - Would also to consider preparation that would deter nematodes (virus vectors)
- Raised beds
  - Raspberry research show that raised beds decrease level of phytopthora root rot (NY study)
- Row covers for weed control
  - White plastic best for high yields and weed control (TX study)

### Cover crops?

- Preplant
  - Will depend on region and cropping history
  - Legume/grass mix

### Raised beds

- Mulches help control weeds
- Raised beds on plastic
  - TX study



### Mulching rows

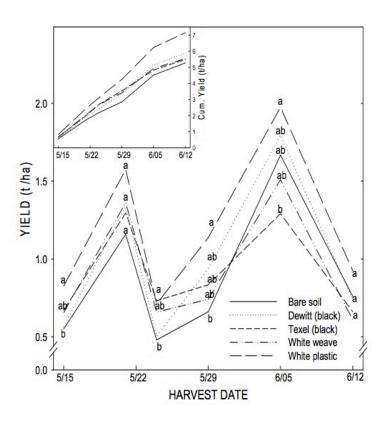


Fig. 3. Mean yield separation of fruit grown under five weed control methods at six harvest dates (P=0.05). Inset: White plastic improved season yield compared to other treatments (P=0.02).

- 4 plastic mulches tested
- White mulch improves yield over bare soil

Source: http://www.subplantsci.org/SPSJ/v59%202007/SPSJ%2059%2095-103%20Makus.pdf

### No plastic

 This photo shows 2 plots with 8 ft strips (foreground left). Behind are 2 plots with one ft strips.



### Weed free zones

#### Methods (conventional spray)

- Planted 'Navaho' plugs in April 2011
- Strip width: 0, 1, 2, 4, 6, and 8 ft.

#### Results

- Between row vegetation consisted of ambient species (crabgrass, Bermuda grass, Florida pusley, spotted spurge, yellow nutsedge, birdsfoot trefoil)
- Yield effects TBD

Source: Jennings and Meyers, NCSU Weed science team

### Alley management

- Alley management
  - Winter
    - Rye or annual ryegrass winter
  - Summer
    - Permanent sod fescue, perennial ryegrass (not Bermuda)
  - Don't allow weeds to grow

### Plant selection

- Cultivars
  - Thornless types less susceptible to double blossom
  - Select based on known problems in growing area
- Virus indexed plants
  - 30+ known viruses
  - Blackberry yellow vein disease (complex of multiple viruses)
- Certified organic plants
  - None known (NY Times article)

### **Blackberry Disease Problems**

- Phytophthora root rot
- Double blossom (Rosette)
- Orange rust
- Viruses
- Crown gall
- Cane blight



## Orange rust



### Double blossom



### Disease resistant

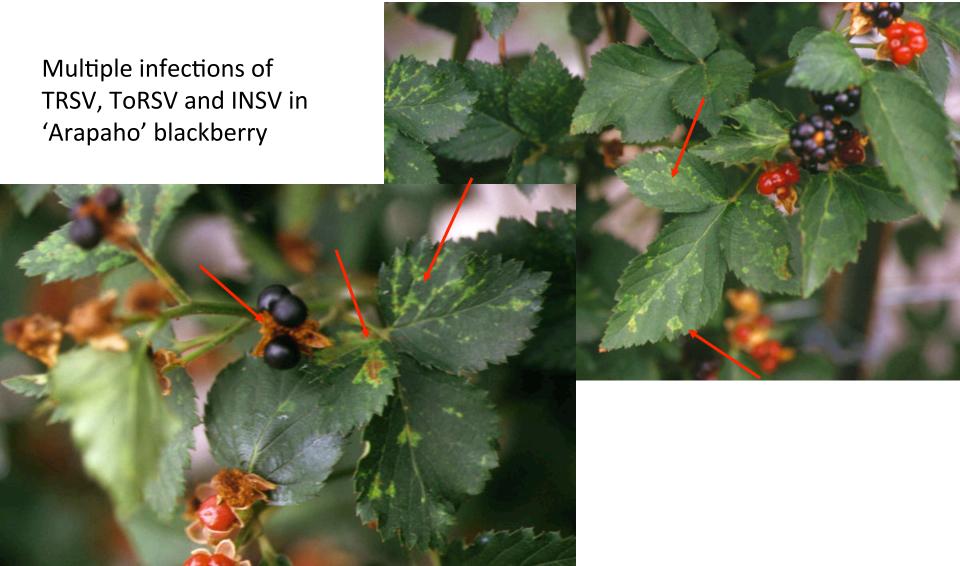
Cultivar	Orange Rust	Double Blossom
Apache	yes	yes
Arapaho	yes	yes/susceptible
Natchez	yes	yes
Navaho	no	high
Ouachita	yes	yes

Sources: Univ. Ark (Clark) and UGA/USDA (Brannen/Buckley)

### Viruses

- Clean virus tested plants
- Many viruses known and named, but don't know which ones are key and in what combination
- Watch for vectors
  - Nematodes
  - Thrips
  - Others

### Viruses



### Crown Gall

- Occurs in grape, peach and more..
- widest host range of any plant pathogen
- Persists 25+years



### Irrigation and Drainage

 Drip irrigation is the only way to go with blackberries and raspberries



## Cane blight



## Soft tipping v. pruning





### Disease: method to minimize

- Phytophthora root rot: raised beds
- Double blossom: resistant cultivar
- Orange rust: resistant cultivar
- Viruses: clean plants
- Crown gall: avoid planting in infected soils/ tolerance?
- Cane blight: tipping not pruning
- Others may become more important in organic systems

### Insects

- Red necked cane borer
- Raspberry crown borer
- Spotted wing drosophila
- Others may become more important in organic systems

## **University Arkansas**

Don Johnson lab

## Bramble Pest Biology

	April	May	June	July	Aug.	Sep.	Oct.
Plant	Blo	om	Fruiti	ng		New	leaves
Clipper	Clip b	ud					
RNCB		Adult Eg	gg La	rva	Gal	ls appea	ır
Stink bugs		Ny	mph /	Adult			
RCB		Larva in	crown		Pupa	Mot	n Eggs
GJB JB	Larva	Pupa	JB	- GJB <u></u>	JBG	JB	

### Pests Reducing Blackberry Yield



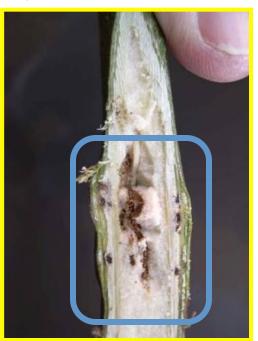


### Rednecked Cane Borer (RNCB)

#### Agrilus ruficollis (F.)

- Family: Buprestidae
- Adult feeds on primocane leaves & lays eggs only on primocanes (May-early June)
- Larva girdles cane = gall (July)
- Gall predisposes canes to winter injury



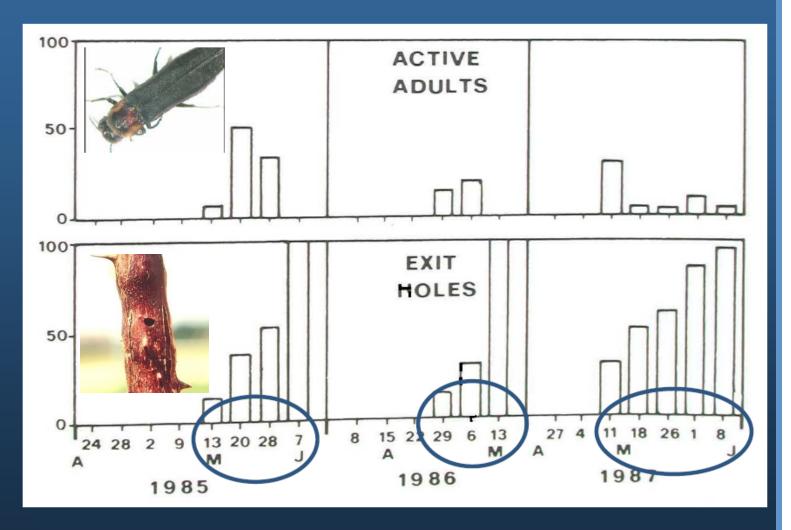






Johnson, 1992, J. Am. Soc. Hort, Sci.

### Rednecked cane borer



Adults emerge = 29 April to 8 June

Johnson and Mayes. 1988. J. Entomol. Sci.

### Rednecked Cane Borer (RNCB)

Scout weekly during the day in May:

- Walk planting looking for:
  - Adults on primocane leaves or
  - Small holes in primocane leaves

Cultural control if < 5% canes galled:

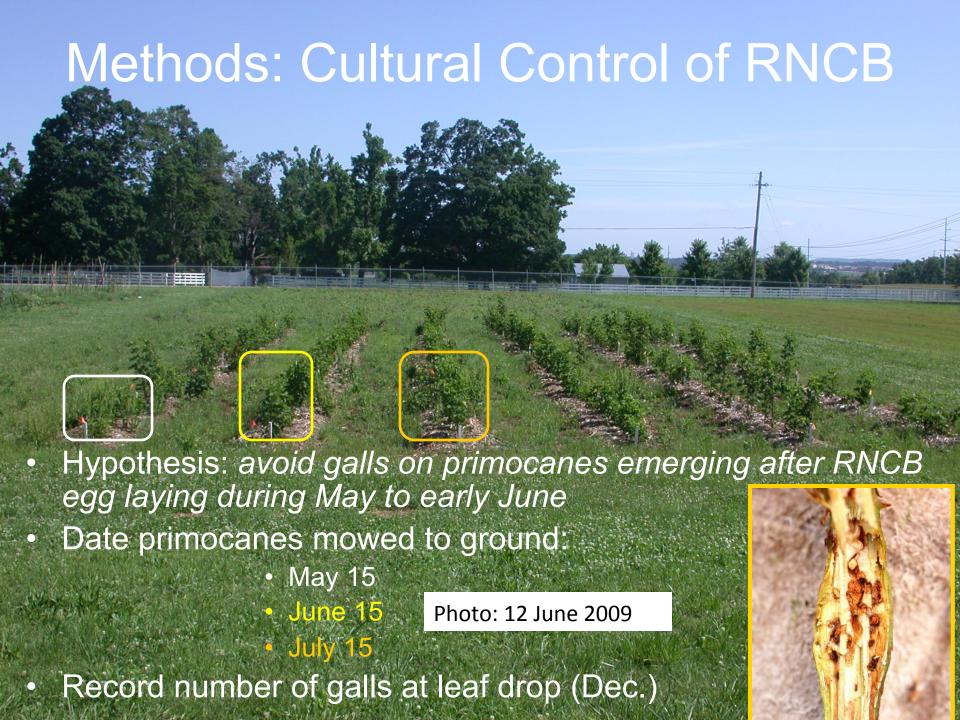
March - remove galled fruiting canes

Chemical control if > 5% galled canes:

OMRI approved but <u>untested</u> for RNCB:







# RNCB Galling Differs By Cane Removal Date for Primocane-bearing Blackberries (2009)

Cane removal date	No. RNCB galls/plot	Yield
May 15	3.1a	Fruit
June 15	1.4b	Fruit
July 15	0.6c	No fruit
<i>Prob. F &gt; P</i>	< 0.0001	

### Preliminary Efficacy Against RNCB

	No. RNCB galls/plot			
Biopesticide	Clarksville, AR <sup>a</sup>	Fayetteville, ARb		
Ecotrol	0.8a	1.4a		
Pyganic	1.0a	0.3a		
Azera	0.4a	-		
Check	1.2a	-		
<i>Prob. F &gt; P</i>	0.53	0.051		

<sup>&</sup>lt;sup>a</sup> Applied on 1 and 9 June 2009

<sup>&</sup>lt;sup>b</sup> Applied on 28 May, 4 and 12 June 2009

### Raspberry Crown Borer

Pennisetia marginata (Harris)

- Family: Sesiidae (clearwing moth)
- Pupa ecloses to adult (Sept.)
- Adults mate and lay eggs on leaves (Oct.)
- Larva tunnels in canes (May-Aug.)
- Reduces crown vigor and kills canes











### Raspberry Crown Borer Control

#### Scouting:

- Late July, cut dead or fruited canes off at soil line and check for larvae and/or tunneling in pith
- September, look for females laying eggs from mid-morning to midafternoon

#### Control:

OMRI approved but <u>untested</u> for RCB

### Spotted Wing Drosophila



- Organic controls limited, some resistance detected
- Lots of data collected
   2011

## Fertility management

- Cover crops and compost can add some fertility
- Supplemental N usually needed
  - 25-50 lbs N year one
  - 50-75 lbs N subsequent years.
- March-May split application
  - 8-5-5 pellet product

#### **USDA-NIFA OREI**

- Organic Blackberry Production Systems for Improved Yield, Fruit Quality, and Food Safety in Fresh and Processed Markets
- Oregon State Univ. and NC State University
- NC
  - Budget, bioactive compounds, post harvest evaluation, training, food safety
- Eric Pond and John Vollmer-grower advisors

## Budget

- Charles Safley, Olha Sydorovych
- Based on NC 10 conventional production budget, with changes based on Vollmer farm practices

## Bioactive compounds



 Moo Jung Kim working in Penny Perkins-Veazie lab

#### Thanks!

- Phil Branen UGA
- Donn Johnson Uark
- Hannah Burrack, NCSU
- Marvin Pritts, Cornell
- Yannis Tzanetakis, U Ark

## Organic Muscadine Grape Production

Terry Bland, Horticultural Science
Bill Cline, Plant Pathology
North Carolina State University
Horticultural Crops Research Station
Castle Hayne, NC





## Topics to be covered:

- Site Selection
- Trellising
- Site preparation
- Weed barriers
- Irrigation

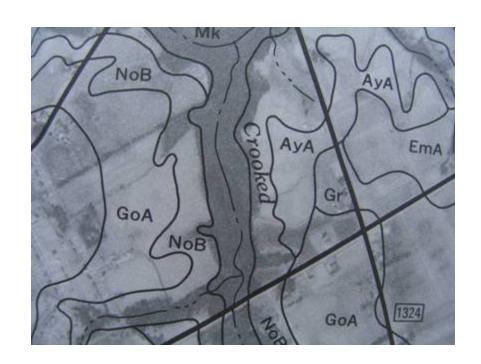
- Cultivars
- Culture
- Diseases
- Insects
- Weeds





# Site selection is the most important decision you will make! Use a county soil map to determine whether your site is suitable for grapes:

- Soil classification
- Soil profile
- What crops grow well on your soil type?
- External drainage
- Internal drainage
- Most zones are irregular in shape
- http:// websoilsurvey.nrcs.usda. gov/app/HomePage.htm



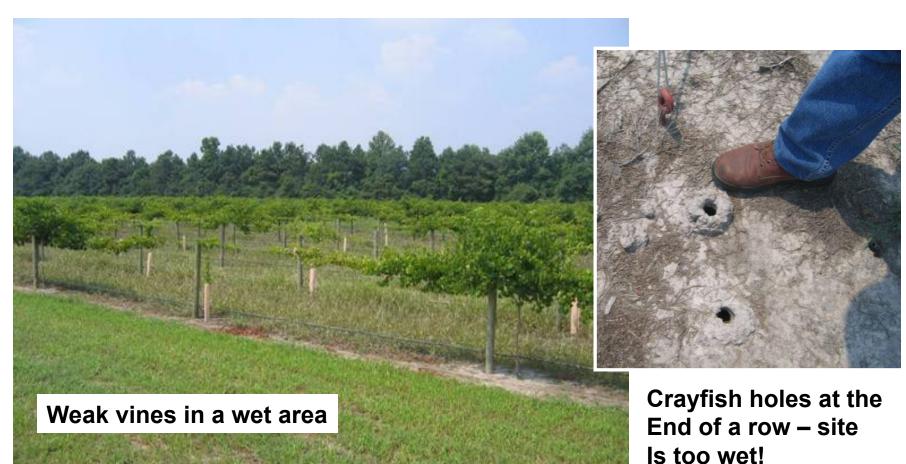
## Site Selection -- Choose a soil with good

internal drainage





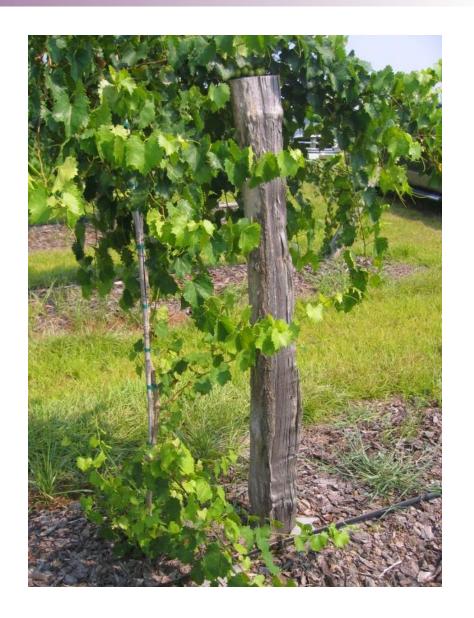
#### Muscadines do not like "wet feet"!





 Use only approved materials such as red cedar, black locust, and metal

NO treated posts







### Weed Control

- Reduce weed populations as much as possible before planting
- After planting utilize natural or synthetic mulches like landscape fabric, grain straw, and hardwood chips
- Grow tubes are recommended





### Mulch around each vine to suppress weeds





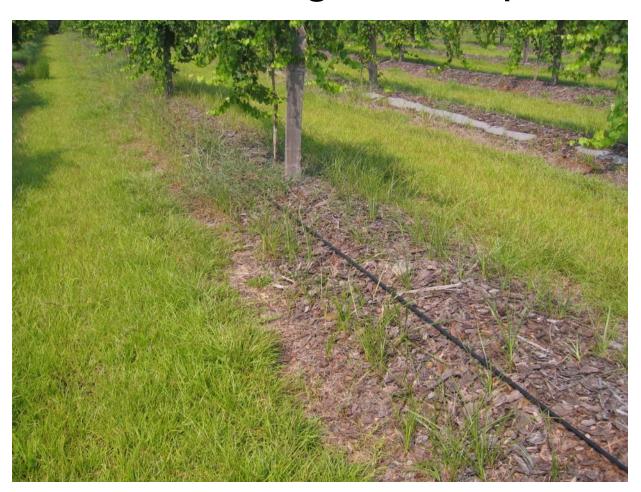


- Biochemical suppression of weeds
- Wheat straw most commonly used





## Synthetic barrier fabric covered with bark mulch and irrigation drip line





## Drip irrigation





### **Fertilization**

- As usual begin with a soil test
- Use only approved sources of plant nutrients
- Keep in mind that natural fertilizers typically release nutrients over a long time period
- Some examples of natural fertilizers are poultry liter, compost, and dried manures



## Compost-amended soil







### Insects

- Although a number of insects feed on various parts of grape vines the grape root borer does the greatest long term damage
- One possible way to reduce borers is the use of a mechanical barrier to prevent the adult females from depositing eggs



## Adult Female Grape Root Borer



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









#### Resources

- www.ams.usda.gov/nop
- www.extension.org/pages18321/can-i-use-input-on-my-organic-farm





## Organic Grapes in the Southeastern US?

- Most organic grapes are grown in arid regions
- Organic production of bunch grapes in the eastern US is very difficult (diseases, weeds)
- Muscadines in backyard plantings are usually not sprayed

- Muscadines are a good candidate for commercial organic production:
  - □ No Downy Mildew, Bunch Grape Anthracnose or Botrytis gray mold
  - ☐ Resistant to Phomopsis
  - ☐ Physically tough, thick-skinned
  - Sulfur can be used to control the biggest disease threat, Powdery Mildew





#### What Causes Fruit to Rot?

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





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





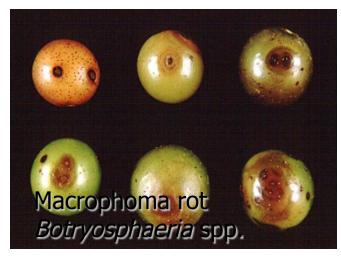


- Fungus (Uncinula necator)
- Appears as faint white "powder" on young fruit
- Causes brown russeting on surface
- Affected fruit cannot ripen normally; may crack





## Fruit Rots









### Leaf Diseases









NC STATE UNIVERSITY

#### Disease Resistance in Muscadines



**Noble** 



## Cultivars vary greatly in susceptibility to rots. In general, the dark-fruited types are more resistant



CULTIVAR RESISTANCE TO DISEASE -- Unsprayed 'Carlos' (left) retains leaves fairly well, while unsprayed 'Granny Val' (right) may not retain enough leaves for fruit to ripen normally





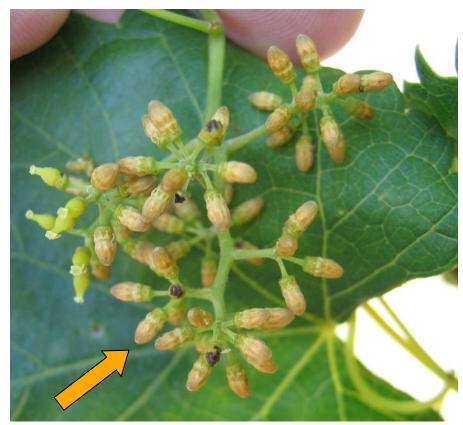


#### Suggestions for Organic Disease Control:

- Plant resistant cultivars (Carlos, Summit, Tara, Triumph, Nesbitt, Noble, Supreme)
- Use detailed pruning to remove overwintered infections (old fruit and fruit pedicels)
- Apply sulfur or Serenade for powdery mildew
- Serenade to suppress rots
- Identify pests and keep records only control the pests that you actually have
- Expect more disease!



## Flowering/Set



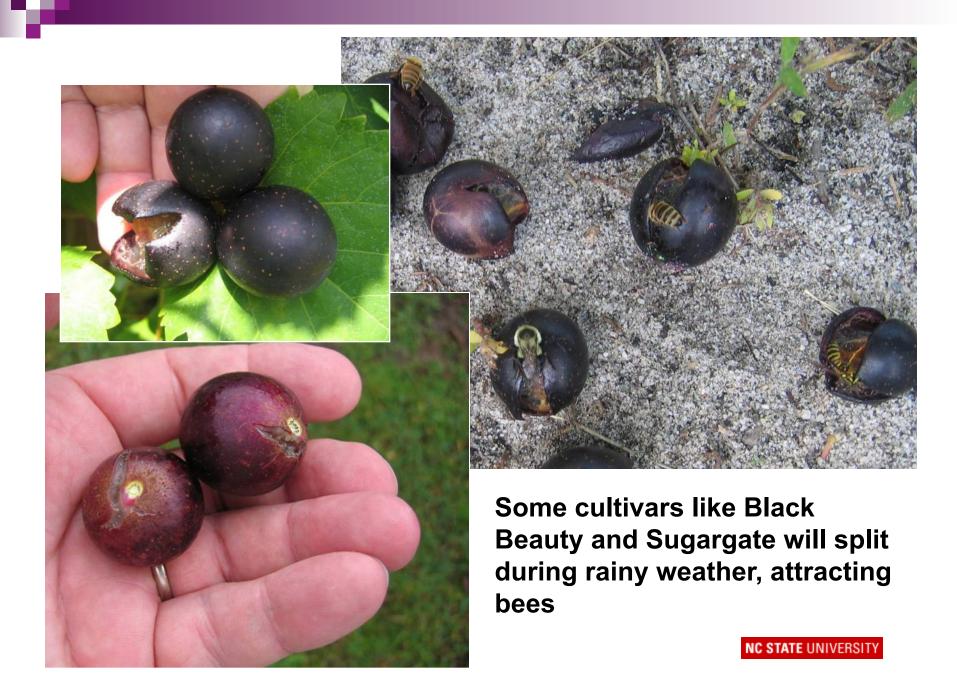
Dry Calyptra (cap) fails to come off, preventing pollination and fruit set on some flowers













## CARLOS (NCSU, 1970)

- Self-fertile
- Highly productive
- Dry stem scar
- Best cultivar for wine
- +90% of NC acreage
- Tart skin
- Not highly rated for fresh market (does not chill well, small size)





## NOBLE (NCSU, 1974)

- Very productive
- Self-fertile
- Stable pigments
- Small size
- Wet stem scar
- #1 muscadine used for wine in Florida
- Not for fresh sales!



# SUMMIT – "Pink-bronze", very productive and vigorous, edible skin, few rots







# TRIUMPH – early-ripening, dry scar, productive, with edible skin, few rots





SUPREME -- Very productive, largest black-fruited cultivar. Some vines died in years 2-4, probably due to overcropping. Thinning or removal of fruit is recommended in early years of production.



# NESBITT – Medium large, perfect-flowered, good vigor, productive, dry stem scar







## MARKETABLE yields at Castle Hayne, NC 2005 (wet year, vineyard not irrigated, no fungicides used).

Cultivar	Berry (g)	Tons/Acre	Cultivar	Berry (g)	Tons/Acre
Carlos	5.2	5.8	Noble	3.6	4.6
Darlene	14.0	1.8	Pam	16.0	5.0
Doreen	4.6	<b></b> a	Scarlett	12.0	0.9
Fry	11.0	5.4	So. Home	6.6	<b></b> a
Gr. Val	14.0	5.5	Sw. Jenny	15.0	1.9 <sup>b</sup>
Higgins	9.5	2.5	Sugargate	14.0	2.4 <sup>c</sup>
Ison	8.0	2.8	Summit	8.5	5.8 <sup>d</sup>
Jumbo	9.3	a	Supreme	16.4	3.6c
Nesbitt		a	Triumph	8.2	3.7

<sup>&</sup>lt;sup>a</sup>Yield not shown for immature vines



<sup>&</sup>lt;sup>b</sup>Sweet Jenny had only 43% marketable due to rots

<sup>&</sup>lt;sup>c</sup>Sugargate had 24% splits, Supreme 7%

<sup>&</sup>lt;sup>d</sup>Summit with 10% loss due to macrophoma rot



## Best performers at Castle Hayne (unfortunately the experiment did not include Tara, Early Fry)

- Triumph (Bronze, early, perfect-flowered)
- Summit (Bronze, mid, female-flowered)
- Nesbitt (Black, late, perfect-flowered)
- Supreme (Black, mid-late, female)
- Scarlett, Pam, Ison recommended for further trial
- Cluster harvest might be used for Fry, Granny Val, Pam (lg brz) and Ison (med blk)



Home-made catcher frames (left) or those designed for blueberries (right) can be used to speed harvest and reduce ground loss





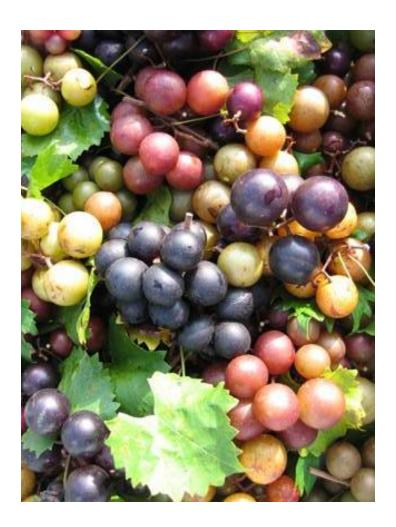


## Where to find plants

- Old Courthouse Nursery (NC) 910-293-9374
- Ison's Nursery (GA) 1-800-733-0324
- Bottoms Nursery (GA) 770-884-5661
- Tinga Nursery (NC) 910-762-1975

#### **WEB RESOURCES:**

http://www.smallfruits.org







#### Resources

- Southern Region Small Fruit Consortium www.smallfruits.org
- Fruit Disease Information Notes http:// www.ces.ncsu.edu/depts/pp/notes/Fruit/fdin012/ fdin012.htm
- Organic Grape Production http://attra.ncat.org/attra-pub/ PDF/grape.pdf
- Resource Guide for Organic Insect and Disease Control http://www.nysaes.cornell.edu/pp/resourceguide/
- EPA Biopesticide database http://www.epa.gov/ oppbppd1/biopesticides/index.htm





'Southern Home' muscadine x vinifera hybrid



# Organic wine grape production in the mid-Atlantic regions??

#### Mizuho Nita, Ph. D.

(sounds like me-zoo-ho, or Navajo)
Research/Extension Grape Pathologist

Virginia Tech, Alson H. Smith, Jr.

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Center

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Organic Agriculture Workshop 8 November, 2011

# Fungal diseases are <u>very</u> common in the mid-Atlantic vineyards

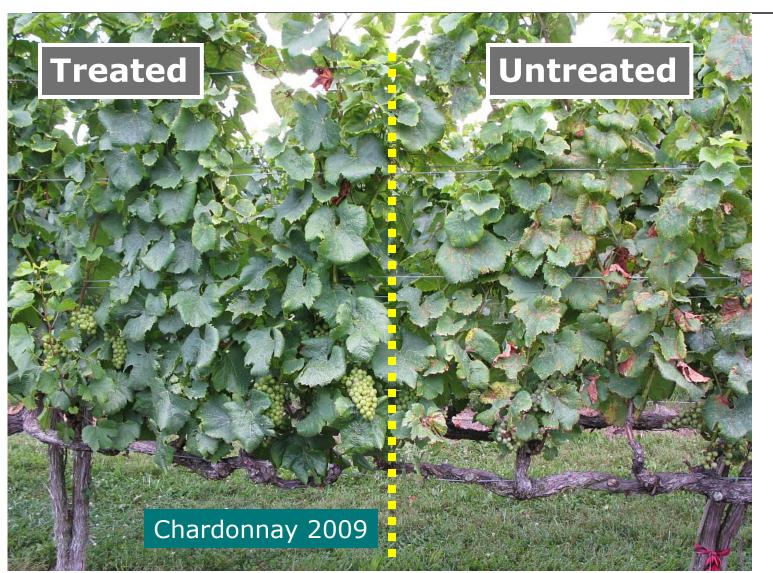
- Due to high humidity (rain and relative humidity) during the growing season
- Variety selection
  - French varieties such as 'Chardonnay' can be grown due to relatively milder winters

It is not a matter of "if", but "when" you see them!

A commercial vineyard in Loudoun county, VA



## Can you grow wine grape in the mid-Atlantic region without chemical management?



# It is not possible to grow susceptible variety without fungicide



# There are many grape diseases, but there are the major fungal diseases in our area that need to be managed

- Downy Mildew
- Powdery Mildew
- Black Rot
- Phomopsis cane and leaf spot
- Botrytis gray mold



Black rot

## It is very important for you to recognize these diseases!



Powdery Mildew

Downy Mildew

The infection conditions and chemicals to be used are different!

#### Downy Mildew

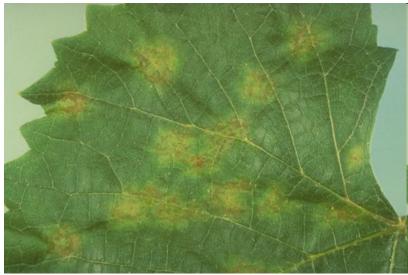
 It can infect leaves and berries, berry infection can cause serious damage

Heavy leaf infection can cause a

defoliation

Oily spot appearance on upper surface





Pictures taken from Organic grape production guide: OSU, Ellis and Nita 2004

## Downy Mildew







#### Powdery Mildew

- It can infect leaves and berries, berry infection can cause serious damage
- Infection of berries during early season can increase the risk of other diseases

It can be found on the both upper and lower surface, but more commonly found on the upper surface





Pictures taken from Organic grape production guide: OSU, Ellis and Nita 2004

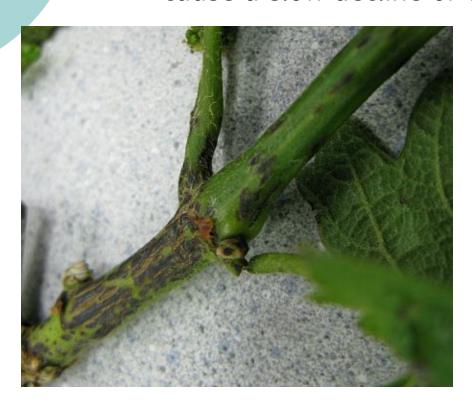
### Powdery Mildew





#### Phomopsis Cane and Leaf Spot

- It can infect leaves, canes, rachis, and berries (up to 30% loss of yield has been reported), it can cause premature drop of berries
- Even though it does not cause major damage, it can cause a slow decline of vines





### Phomopsis cane and leaf spot





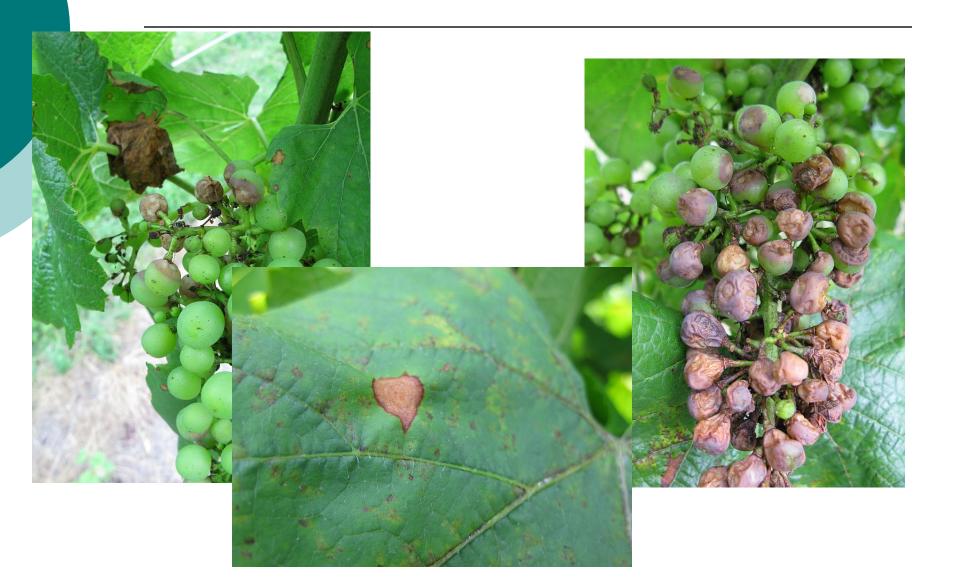
#### Black Rot

- It can infect leaves and berries, berry infection can cause serious damage
- Infected berries will produce spores next year





### **Black Rot**



#### **Botrytis**

 It can cause damage to berries, and can be very significant



### **Botrytis Bunch Rot**





## How these disease occur?

 Pathogens need to have a certain conditions to infect and cause disease

Host (grape)





# The management of disease = aiming to break the disease triangle

Host

Use of Genetic Resistance

Variety Selection

Cultural Control

Site selection

Sanitation

- Pruning methods
- Vine training methods

**Chemical Control** 

- Use of fungicide
- Biological Control
  - Some agents are available, but results are not consistent

Pathogen

Environment

Integrated
Pest
Management
(IPM)

# Why is Integrated Pest Management (IPM) Important?

- You can **not** protect your vines without integrating various management strategies.
  - Most of wine grapes are not meant to be grown in our area
  - Overuse or misuse of chemical will cause issues that are bigger than you can handle
    - Chemical resistant isolates that cannot be managed by a fungicide(s)

# Why is Integrated Pest Management (IPM) Important?

- To save your money and time
  - Proper viticulture practices will reduce the risk of disease, increase yield, and prolong life of your vines
- To save the environment, your money and time
  - Proper disease management practices will:
    - Reduce the risk of chemical misuse (injury to you and your vine)
    - Reduce the risk of development of resistant isolates
    - Save your (and chemical companies') money.

# So what are components for *Organic* grape production IPM?

- Variety Selection
  - This will be the KEY for your success
- Site Selection
  - Air movement and degree days
- Canopy Management
  - + Training system
    - o Once again, air movement!
- Sanitation
  - Remove infected or dead tissues out from the vineyard
- Fungicide application
  - Our choices are limited...



# Black rot management is the key for our growing area

- Sulfur materials provide control against powdery mildew
  - Potassium bicarbonate materials (Kaligreen, Milstop)
  - Regalia SC (Reynoutria sachalinensis)
  - Serenade (Bacillus subtilis)
  - Oils (SuffOil-X, Trilogy, etc)
- Copper materials provide control against downy mildew, Botrytis, and Phomopsis
  - 0.05% lime sulfur against Phomopsis works
- Botrytis prefers some variety more so than others. Many of reds are moderately susceptible to Bot.



#### Variety Selection

- Since we do not have any materials against black rot at this point, variety selection will be the backbone of your IPM
- Slightly susceptible varieties for black rot
  - Cascade, Cayuga White, Chancellor, Chelois, Corot noir, DeChaunac, Elvira, GR7, Ives, Marquette, Noiret, Traminette, Vidal blanc, and Vignoles.



### **Cultural Practices**

- Site selection
  - Air circulation is the key!
- Sanitation
  - Many pathogens survive on or in wood tissues during the winter
  - Removal of infected tissues (woods and berries)
    - Both during growing season and winter
- Canopy management
  - Cane pruning vs. Cordon pruning
  - Shoot positioning and leaf removal



## **Chemical Management**

- Materials that may have efficacy against black rot
  - Copper (various formulations)
    - Inconsistent results
- Materials that are discussed (i.e., no formal testing was done)
  - Oxidate
    - Unlikely provide protective activity
    - It may reduce the disease spread...
  - Regalia
    - 0 ???

## **Environmental monitoring**

- Each disease has a specific condition for infection and disease development
- Monitoring weather will help grower examine the risk of disease development



Black rot
infection
conditions
Spotts 1977

Temperature in °F	Temperature in ºC	Minimum Leaf Wetness Duration (hr) for Light Infection
50	10	24
55	13	12
60	16	9
65	18	8
70	21	7
75	24	7
80	27	6
85	29	9
90	32	12

### Scouting of diseases and insects

- Since the chemical management options are not as effective as conventional approaches, you need to scout frequently to observe disease development
  - Weekly, on foot, 2-3 locations per vineyard
  - Some have "sentinel" vines that do not receive any fungicide
- There are not many options for "curative" or "kick-back" treatments

# A little bit about insect management

- There are several materials against
   Grape Berry Moth
  - Biobit HP (Bacillus thuninglensis)
  - Entrust (spinosad)
  - Aza-Direct (azadirachtin)
- We do not have sufficient data for Japanese beetle and leafhoppers
- Oils (JMS Stylet Oil) are effective against spider mites
- Once again, scouting is important

# How about other diseases? Ripe Rot, Sour Rot, etc?

- These rate season rots are more difficult to predict its outbreak because multiple pathogens can be involved.
  - Rainy conditions as we observed this year in VA were ideal for these diseases
- There are not many studies done for these diseases, even with conventional approach
- Once again, canopy management and site selection are key



# Resources on Grape Disease Management

### My blog

- Updated almost daily during the season
- Please refer to my handout for URLs



### Organic Grape-specific Guides



#### Organic Small Fruit Disease Management Guidelines

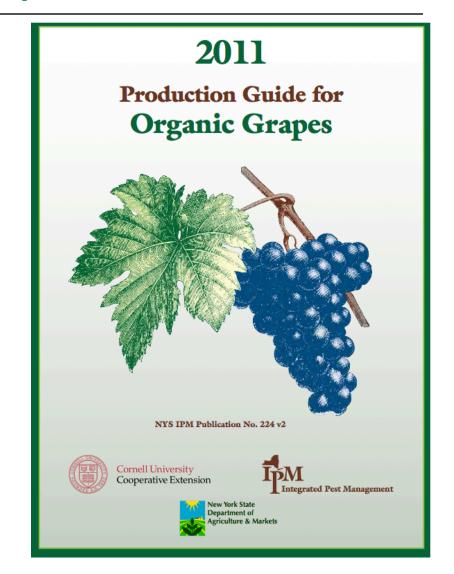
#### **Integrated Management of Grape Diseases**

Prepared by Mike A. Ellis, Professor and Mizuho Nita,

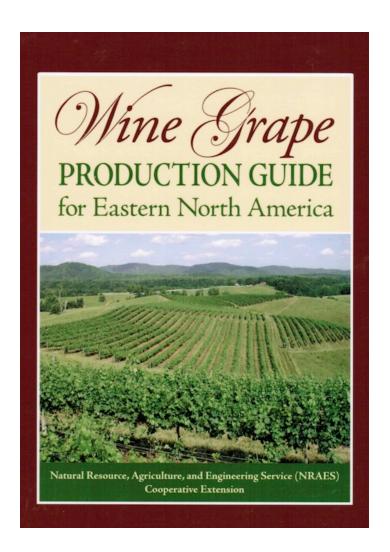
Mizuho Nita, Graduate Research Associate

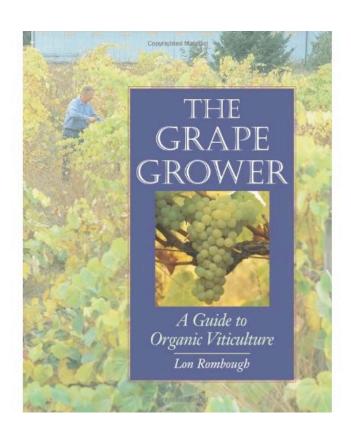
Department of Plant Pathology at the Ohio State University/OARDC

This PDF file is provided as a part of "OSU Fruit Disease Resources" website (http://www.oardc.ohio-state.edu/fruitpathology/).



### Viticulture Books





## What is your priority?

- Increase your yield
  - Quality
  - Quantity
- Disease management need to make sense to you in terms of
  - Economy
  - Ecology
- Please spend time during off season to be better prepare for next season!!

### Thank you for your attention!

Please keep coming to vineyard meetings and workshops in the future.

Any Questions?







# Organic Winegrape Production in NC Our Experience

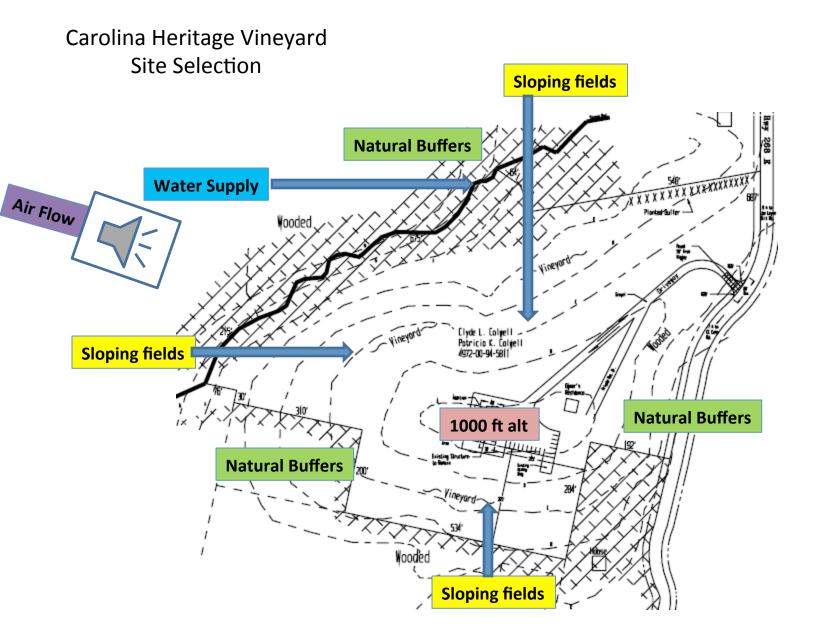
Site Selection
Varietal Selection
Organic Certification Process

Pat and Clyde Colwell

<a href="http://www.facebook.com/pages/Carolina-Heritage-Vineyard-Winery">www.facebook.com/pages/Carolina-Heritage-Vineyard-Winery</a>
(336) 366-3301

### Site Selection

- Key challenges to organic viticulture in NC
  - Humidity + warm weather => mildew/fungus
  - Insects
  - Inconsistent weather year-to-year
- Sites to best address these challenges
  - >1000 ft altitude
  - Sloping land
  - Good airflow
  - Open area with natural buffers on sides of property
  - Ample water supply
  - Good clay/loam soil
  - No recent history of grape insect/disease issues





Carolina Heritage Vineyard & Winery Organic Winegrape Production November 8, 2011



Carolina Heritage Vineyard & Winery Organic Winegrape Production November 8, 2011

### Varietal Selection

- Best varietals for organic vineyards in NC:
  - Grapes which are best suited for micro-climate of location
    - # Growing-degree-days (GDD)
    - Varieties with early budbreak ⇔ Location with late spring frosts?
    - Varieties which ripen early ⇔ June Bug Infestations?
    - Varieties which ripen late 
       \top Location with early autumn frosts?
  - Native grapes
    - Natural defenses against native pests and diseases
    - Muscadines
      - Not all varieties are cold-hardy (ie. < 9 degrees F)</li>
      - Not all varieties make good wine, etc
    - Native hybrids (eg. Norton)
      - Sometimes a bit challenging to get started
  - European/American Hybrids which are more disease/pest tolerant
    - Cornell Research Station
    - University of Minnesota (Cold-hardy grapes)
- Our recommendation to vineyards: Choose the grapes you like (within these parameters)! You'll enjoy giving them the attention they will demand to do well and you'll truly enjoy the fruits of your labor!

# Carolina Heritage Vineyard Varietal Placement ¥ooded, Muscadines **Hybrids** Clyde L. Colgell -Potricio K. Colgell 4972-00-94-5811 **Hybrids Hybrids**

#### Carolina Heritage Vineyard



Keep your location's micro-climate in mind when selecting varietals.



## Organic Pest Management

- Build the soil and vine strength !!!!!!!
  - Test soil regularly and treat with needed nutrients
    - Organic Fertilizers are available (albeit are often a bit more expensive)
  - Plant cover crops which return nutrients to soil (eg clover)
  - Plant vines with worm castings & mycchorozial fungi
- Monitor for pests constantly!
- Use preventative measures
  - Compost Teas disease control
  - Chickens, guinea fowl insect control
- Be proactive when as soon as specific pests discovered:
  - Mildews
    - Serenade, Oxidate, Sonata, JMS Stylet Oil, Sulfur, canopy thinning
  - Insects
    - Surround, Insecticidal soap, Dipel
  - Opossum
    - Live traps
  - Birds
    - Bird distress calls, Bird netting
  - Deer
    - Predator calls, dogs, Electric fencing

Brand Name	General Material	Purpose	Currently Used (C) Potentially Used (P)	Label Datasheet Attached
Harmony		Fertilizer (5-4-3)	P	No – submitted last year
NatureSafe-Pelleted		Fertilizer (13-0-0) – correct P deficiencies as indicated by soil test	P	No – submitted last year
JMS Stylet Oil		Fungicide – stop mildews which were harbored in the vines over winter	С	No – submitted last year
Matratec		Herbicide – plan to use where mechanical removal of weeds is not working effectively	P	No – submitted last year
Trilogy		Fungicide – stop mildews	P	No – submitted last year
Sonata		Fungicide – stop mildews	P	No – submitted last year
Heteromask		Insecticide - Beneficial Nematodes (Hb)	P	No – submitted last year
	Lime	Correct pH as need indicated by soil test - (Fields A,B,C,D and H)	Р	No
	Rock Phosphate	Correct P as need indicated by soil test – all fields	P	No – submitted last year
	Sulfate of Potash	Correct K as need indicated by soil test (Field H only)	P	No – submitted last year

# HARMONY In Tune With Nature\*

# 5-4-3

AG. ORGANIC WITH 9% CALCIUM

#### APPLY ONLY AS DIRECTED

USE HARMONY PRODUCTS AND PROGRAMS FOR ANNUAL:

MUTRIES ADDITIONS OF ORGANIC MATTER

MAINTENANCE OF C:N RATIOS

MANUFACTURED/GUARANTEED BY ENVIRONMENTAL PRODUCTS, LLC 4415 PHEASANT RIDGE RD SUITE 305B ROANOKE, VA 24014 / 800 343-6343

#### GUARANTEED ANALYSIS

AVAILABLE PHOSPHATE (P<sub>2</sub>O<sub>5</sub>) ..... 4 0% SOLUBLE POTASH (K<sub>2</sub>O) ....... 3,0%

PLANT NUTRIENTS DERIVED FROM Processed Poultry Manure

\*4.0% slowly available nitrogen from processed poultry manute

TURF 5-4-3 can be applied to any type of grass at any time of year. It is always good and twice during the fall. Warm Season Grasses: Apply every two months during growing season. Prior to Seeding or Sodding: Apply to area to be seeded or sodded.

#### COVERAGE

#### TURF:

FOR LEB, OF NITROGEN, APPLY ALA FULL RATE OF 20 LBS, PER 1,000 SQ, FT., ONE BAG OF 5-4-3 WILL COVER 2,500 SQ, FT. OR 5,000 SQ FT AT A HALL RATE.

#### LANDSCAPE APPLICATION:

SHRUBS TOPICALLY APPLY OR LIGHTLY SCRATCH INTO THE SOIL SURFACE AT 5 LBS. PER 1,000 SQ. FT...

FLOWERS - APPLY 3 1.BS. PER 100 SQ. FT., LATER IN THE GROWING SEASON, A SECOND APPLICATION CAN BE MADE.

TREES - APPLY 10 CUPS OF 5-4-3 FOR EACH 1- INCH OF TRUNK PROMETER.



\* Listed by the Organic Materials Review Institute (OMRI, for use in organic production.

#### TECHNICAL PRODUCT SPECIFICATIONS

5-4-3 9% Ca

C:N Ratio 6.0:1 Salt Index 16 Organic Matter 70%

NET WEIGHT 50 LB. (22.7 Kg)

#F1066

REV. 1/04



#### Carolina Heritage Vineyard



June Bugs devouring Rubiana cluster July 28, 2010

#### Last Updated: 02/26/2011 **CROP (FIELD)** 2008 2009 2007 2010 **2011** (Italics = plan) Noble (A) Feb 17 - began pruning Feb: + Lime Mar 2: + Lime (1T/Ac) Apr 6 - finished pruning Dec 20 2010 - finished pruning 1.5 Acres Note: Despite deep pruning, March: + Lime Mar 15 - finished pruning Mar 2 - began pruning Mar 2 - began pruning mites noted on vines Apr 1+ NatureSafe 13-0-0 Mar 16+NatureSafe 13-0-0 (8oz/ Apr 7 JMS Stylet Oil (2%) April: + Harmony 5-4-3 Jun + Harmony (8oz/plt) plt) Jul - mulched vines Apr 19 JMS Stylet Oil (2%) Apr 18 - finished pruning Apr 5 - finished pruning May: + Harmony 5-4-3 Apr 30 - noted dying cordons from $$\operatorname{\mathsf{Apr}}$21$ - Heavy rain Jul + worm castings Apr 18 - Budbreak June: + Harmony 5-4-3 frost damage May 8 + Harmony 5-4-3 Apr 30 + Harmony 5-4-3 June - Aug: sticky tape & May 2 & 3 - Light rain Jul 22 - Japanese Beetles active (300lbs/A) (300lbs/A) phermone traps As Needed (Mildew): THAT Jul 23 Surround(25#/60gal) June 14 + Harmony 5-4-3 Jun 6 - set out phermone sticky May 6 + Harmony 5-4-3 flowable sulfur; JMS Stylet Oil: Jul 23 Champion(4#/60gal) (2cups/plant)- first 2 rows (200lbs/A) tapes & traps Oxidate Aug 5 Serenade (1 oz/g), Jun 7 Lime sulfur spray (1 oz/ As Needed (Beetles): Surround; **Sept Beneficial Nematodes** Molasses (1 oz/q), Fish May 16 - Heavy rain Insecticidal Soal gal) Emulsion (1 oz/g) Jul 2 Oxidate (1.28 oz/gal) May 17 JMS Stylet Oil (1%) Aug 2 JMS Stylet Oil (2%) May 28 THAT flowable sulfur Aug 30 Found Grape Root Borer June 1-5 - rain in phermone trap **Sept 16 Beneficial Nematodes** June 7 Trilogy mixed with (Heteromask) JMS Stylet Oil (1%) June 10: + Lime (1/2T/Ac) June 13-19 - rain June 25 Oxidate (64oz/50gal) + THAT July 10 - set phermone traps out for grape root borer July 18 - rain July 19 Oxidate (22oz/53gal) + Trilogy (22oz/53gal) Aug 1 - Grape root borers forund in traps Aug - Kept out root borer phermone traps Aug - rain and high temps nearly all month Sept 25 - Harvested

Carolina Heritage Vineyard - Field Record & Plan

## Organic Growers' Resources

- Surry Community College Viticulture & Enology Program
   Central Carolina Community College Sustainable Agriculture Program
- Carolina Farm Stewardship Association (CFSA) www.carolinafarmstewards.org
- Organic Growers' School UNC Asheville (March 5-6, 2011)

#### www.organicgrowersschool.org

- Richard Boylan NC Extension Agent familiar with organic practices
- **Certifying Agencies** familiar with NC growing conditions and vineyard certification:
  - Clemson University's Department of Plant Industry . [864-646-2140.] certify USDA National Organic Program (NOP) organic operations in the three major categories of certification: crops, livestock and processing.
  - International Certification Services, Inc [701-486-3578] offers several programs to help you with your organic and sustainable certification.
    - USDA National Organic Program (NOP) required to market organic products in US
    - Farm Verified Organic: Encompassing the USDA NOP, the FVO program increases market access internationally.
    - <u>Canadian Organic Regime</u>: accredited by the Canadian Food Inspection Agency (CFIA) to certify organic products, under the Organic Products Regulations, 2009
    - Food Alliance handles inspections for Food Alliance, a sustainable certification program.
    - JAS, EC 834/2007 (previously EEC 2092/91)
    - Bio Suisse.

### **Organic Certification Process**

- Education -Take advantage of all resources
  - CFSA Conferences, Organic Growers' School, ASU and UNC-Asheville seminars
  - Order the OMRI Guide and study it!
  - Periodic Organic Certification Workshops
- Plan for Certification 3-year process
  - Keep records in detail of all vineyard actions (why, what, when, how much?)
  - Use organic seeds & plant-stock and/or have record of search for this material
  - Do <u>not</u> use prohibited substances (3 years record of no use required.)
  - Ensure have buffers (at least 20 feet) between neighboring fields and your "organic" fields
  - Keep equipment used for "organic" fields separate or have detailed cleaning process between uses
  - Be pro-active on improving the environment, soil, natural predator habitats, etc
  - Keep copies of labels for all substances used
- Selecting a Certifying Agency 1 year prior to 1st inspection
  - Easiest if you have that agency's forms and use them for a year prior to 1<sup>st</sup> Inspection
  - Fees are similar across agencies
  - Look for agency with:
    - Familiarity with NC growing conditions
    - Experience with vineyard certifications
    - A local certifier (as you will pay travel costs)
  - Talk to others in industry regarding their experiences with different agencies
  - Engage the agency of your choice ahead of time on use of any new substances
- Inspection 6-9 month process
  - Submit completed forms as early in the year as possible
    - Generally 2 reviews of your forms will occur prior to your on-site inspection
    - · Leave sufficient time to schedule inspection when you're not 100% pre-occupied with vineyard tasks
  - Plan to spend entire day with Inspector on day of your inspection.
    - · Will want to walk entire vineyard, check equipment and storage area s for input substances, etc
    - · Will want to go through your form input with you in detail
  - Be responsive if agency and/or inspector has additional requests
  - Final review following inspection can take an additional 1-2 months, depending on outstanding items

# Application sections and attachments for 2011 Organic re-Certification Carolina Heritage Vineyard

- 1. Module 1R Renewal Form original signed and will be mailed with Module 3 Production Agreement
- 2. Module 5 Field & Livestock Identification
- 3. Attachment Map of Field Layout
- 4. Module 6 Environmental Impact, Soil Conservation & Biodiversity
- 5. Module 7 <u>Seeds, Seedlings and Planting Stock</u>
- 6. Module 8 Soil Building/Fertility Management Plan
- 7. Attachment: Spreadsheet showing all Field Inputs 2005 2010
- 8. Module 9 Split & Parallel Production
- 9. Module 11 Weed, Pest and Disease Management Field
- 10. Module 00 2010 Off Farm Input List
- 11. Field Record of all Proposed Inputs for 2010
- 12. Attachments: <u>Labels/OMRI certificates for proposed Farm Inputs</u>
- 13. Module 12 Water Farm/Ranch
- 14. Module 13 <u>Harvest/Post Harvest, Crop storage & Sales</u>
- 15. Attachment: Example of Wine Production Spreadsheet

## Module 6: Environmental Impact, Soil Conservation, and Biodiversity NOP 205.200, 205.201, 205.203

- •Describe the general topography of your farm.
- •Please describe <u>any areas on your farm that has evidence some erosion. What is the cause?</u> What are you doing to prevent it?
- •What equipment do you use for tillage?
- •Describe your tillage practices. How do you minimize the negative effects of tillage, namely soil compaction and disruption of the soil's structure? How do your tillage practices maintain surface residues?
- •Describe all fallowing practices on your farm. Is bare fallow used, and if so, how and for how long? With what frequency do you employ these practices? Are they documented in your records?

# All programs other than the NOP (i.e. FVO, EEC, Bio Suisse, etc) please complete the following questions.

- •Describe how you <u>encourage and monitor bio-diversity on your farm or ranch</u>. Biodiversity refers not only to the different species you cultivate, but also to the fostering of environment (s) in which wild species (such as insects, birds, mammals, etc.) can thrive.
- •List wildlife and dominant native plants present on the farm.

# Carolina Heritage Vineyard **Erosion Areas** ¥ooded **Erosion Erosion** Clyde L. Colgell -Potricio K. Colgell 4972-00-94-5811 **Erosion**

#### Backup:

# Application sections and attachments for 2011 Organic re-Certification Carolina Heritage Winery

- 16. Module 13A <u>Inventory</u> Table
- 17. Module 18 Processed/Handled Products Overview
- 18. Module 19M Carlos Wine Details
- 19. Module 19M Noble Wine Details
- 20. Module 19M Honey Mead Details
- 21. Module 19M Blueberry Wine Details
- 22. Module 20 Processing Facilities and Product Flow
- 23. Attachment: Facility Layout
- 24. Attachment: Wine Processing Flow Diagram
- 25. Module 21 Water Processing/Handling
- 26. Module 22 Receiving, Storage and Shipping
- 27. Module 23 Audit System Handler/Processor
- 28. Module 24 Quality Control
- 29. Module 25 Sanitation and Clean Out Procedures
- 30. Module 26 Structural Pest Control

# Example: Organic Certification Fees

- I. Organic Crop Production Fees:
- Initial Application Fee (Non-refundable) \$500
- Annual Renewal Fee \$400
- \*Inspection Fee: (based on acreage)
- first 20 acres (minimum 10 acres) \$10 / acre
- above 20 acres \$5 / acre
- II. Organic Livestock, Poultry, and/or Handler/Processor Fees:
- Initial Application Fee (Non-refundable) \$500
- Annual Renewal Fee \$400
- Inspection Fee: (based on gross sales)
- <\$15,000 / year **\$100**
- \$15,001 \$40,000 / year **\$200**
- >\$40,000 / year **\$300**
- III. Miscellaneous Fees:
- Postage and handling of unsigned or incomplete applications....Actual cost
- Copies of official documents......Greater of \$5 or \$0.25/page
- Out of state travel......Mileage and expenses at Clemson University rate
- IV. Late Fees for Renewals:
- Recertification applications and renewal fees are due at the DPI office no
- later than 60 days prior to the anniversary date of the applicant's initial
- certification. Any recertification applications and renewal fees that are
- submitted after this time period will be that ged a \$50.00 late fee.



3709 Hillsborough Street Raleigh, NC 27607-5464 919-515-2851 fax 919-515-7981 NC CIA@ncsu.edu

Certificate # OF 728019

### **Organic Farm Certificate**

North Carolina Crop Improvement Association, Inchas determined that

#### CAROLINA HERITAGE VINEYARDS

Clyde & Pat Colwell 170 Heritage Vines Way Elkin, NC 28621

Certification # 795108

complies with the Organic Certification Standards of the United States Department of Agriculture National Organic Program, producing

Organic Blueberries and Grapes



Director, NCCIA

July 21, 2008

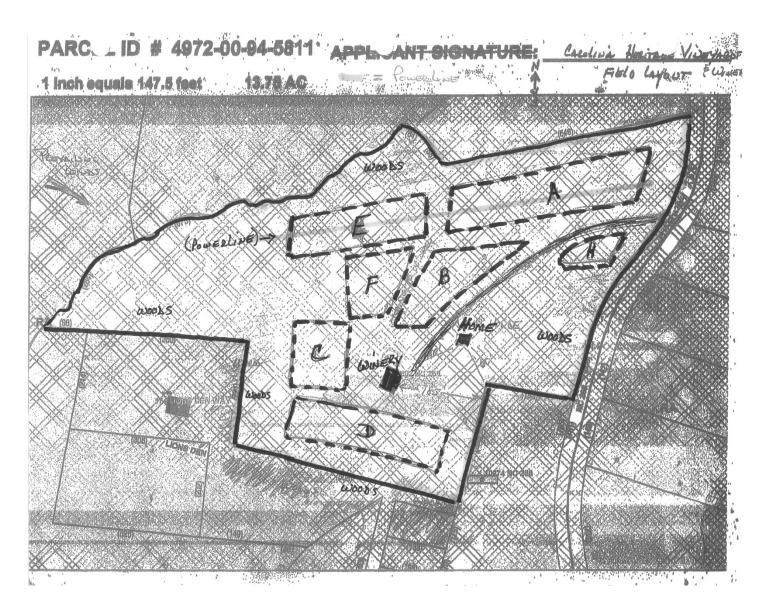
Inspection Date

August 13, 2008

Date First Certified



### Thank You!



### RESOURCES

http://www.oardc.ohio-state.edu/fruitpathology/organic/PDF/OSU-Organic-Bramble-Diseases.pdf

http://teamrubus.blogspot.com/2011/09/list-of-blackberry-and-raspberry.html

 $\frac{http://www.nytimes.com/2011/09/23/us/farmers-seek-to-raise-standards-for-berries.html?emc=tnt&tntemail0=y$ 

http://eorganic.info