New Grape Grower Workshop: Basic Disease Management

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Some slides from:
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Major Grapevine Diseases in the Mid-Atlantic

- Downy Mildew
- Powdery Mildew
- Black Rot
- Phomopsis
- Botrytis
- Late season fruit rots
Why do diseases matter?

- Reduce yield, fruit marketability, and fruit / wine quality
  - Fruit rot and fruit blemishing
- Reduce vine vigor → reduced yields
  - Foliar leaf spot and mildews
  - Cane diseases
  - Trunk cankers / galls
  - Root rot
  - Systemic diseases (viruses, Peirce's disease)
- Shorten longevity of the vineyard
Important principles for disease management

1. CHEMICALS. Fungi are the only pathogen group you can control with chemicals
   → All major fungal pathogens are at risk of becoming resistant to single site of action chemical groups
   → Rotate the numbers

2. TIMING. Fungal pathogens vary timing of chemical control
   → Scouting and accurate disease identification are key to effective chemical use
   → Understand the environmental conditions under which you need to spray

3. CANOPY MANAGEMENT. Critical for control fungal fruit, leaf and cane diseases
   → Reducing humidity reduces infections
   → Canopy management increases penetration of pesticides

4. INOCULUM SOURCES. Reduce disease pressure and epidemics of fungal diseases by managing overwintering inoculum
   → If survival is in wood: Dormant sprays kill overwintering inoculum on wood
   → If survival is in berries, canes, and debris: Remove from the canopy; spring cultivate, mulch, remove or burn to suppress spread
Important principles for disease management

5. CLEAN STOCK. Important for ALL plant pathogens, but is the ONLY preventative management option for viruses and crown gall

6. Only some things can be cured
   - There is no cure for viruses, crown gall, root rot or trunk canker diseases
   - Once it’s in the plant, removal is the only option
A Moment to Ponder

• In the humid, hot conditions of Maryland, management of diseases is one of the critical factors for a successful vineyard.

• Requires an integrated approach

• Not much room for continual errors
When do you manage fungal fruit diseases? It depends on the disease!
Plants are at greatest risk between **pre-bloom and post bloom**, for most fungal diseases.
Disease with multiple infection periods within a single season

→ Most fruit pathogens in this region have multiple infection cycles

→ For these kinds of diseases, you can get epidemics that reduce yield or result in no yield

→ To prevent epidemics it is necessary to protect throughout the season, or until berries are no longer susceptible
Black rot

**Epidemics can cause major yield losses**

**Diagnostic symptoms:**
- Red leaf spot with small black bodies
- Blackening of immature berries starting early in the season

**Pre-bloom to 2 weeks post bloom is the most critical spray time**

**Berries become resistant with age: may have to spray until 6 weeks post bloom**

FACT SHEET FOR BLACK ROT: https://grapesandwine.cals.cornell.edu/newsletters/appellation-cornell/2014-newsletters/issue-17/managing-black-rot
Downy mildew

Epidemics cause major yield losses

Diagnostic symptoms
- Leaf spots with white powder on leaf underside
- Developing fruit also become infected

Overwinters in soil debris

Berries become resistant with age

Spray when cloudy, warm and wet

Use DM specific fungicides for effective control

Canopy management is critical

FACT SHEET FOR DOWNY MILDEW: http://nysipm.cornell.edu/factsheets/grapes/diseases/downy_mildew.pdf
Downy mildew is easily confused with Powdery mildew
Controlled VERY differently
How to tell them apart:

DOWNY: White mildew is on leaf **underside**

POWDERY: White mildew is on leaf **top**

Powdery mildew control
- Overwinters in wood
- Canopy management critical
- Secondary spread is most affected by temperature
- Repeat infections occur below 90 F
  → Sulfur is the most effective control, if varieties are not sensitive

FACT SHEET FOR POWDERY MILDEW:
http://www.practicalwinery.com/marapr03/marapr03p16.htm
Dr. Wayne Wilcox, Professor and Plant Pathologist, Cornell
Fruit diseases with a single infection period within the season

→ For these kinds of diseases, continuous protection through the season is not necessary
PHOMOPSIS CANE AND LEAF SPOT

PRIMARY INOCULUM

pycnidiospores exude from pycnidia in wet weather and are rain-splashed to developing shoots, leaves, and clusters

Rachis infection occurs during spring and early summer

Fruit infection occurs during and shortly after bloom

Black fruiting bodies (pycnidia) overwinter on the vine in infected dormant canes and rachises

Cane and leaf spot symptoms appear 3-4 weeks after infection

Fruit and rachis infections remain latent until late in the growing season, near harvest.
Phomopsis cane and leaf spot (and fruit spot)

**Diagnostic symptoms:**
- Black spots and scabs on green shoot
- Old shoots bleached with black spots

**Inoculum in wood and canes**

**Spray from 1” shoot growth through fruit set**

FACT SHEET FOR PHOMOPSIS: http://nysipm.cornell.edu/factsheets/grapes/diseases/phomopsis.pdf
Botrytis bunch rot and Ripe rot

Botrytis bunch rot
Symptoms: grey / brown spores on fruit, dead blossoms, and other dead tissue

Ripe rot
Symptoms: berry shriveling and browning; black specks on surface
• Botrytis bunch rot and ripe rot pathogens infect flowers at bloom
→ Bloom-time fungicide applications critical to protect flowers
• Pre-harvest applications after bloom to protect developing and ripe fruit, if disease pressure is high
• Canopy management is critical for these diseases
Not the same as sour rot

- Characterized by sour odor
- Considered to be a secondary effect of disease or other berry damage
  - Insects might be important in this region
- No fungicides available
  - Avoid damage / other diseases
  - Control of insects may also be important

FACT SHEET FOR FRUIT ROTS: http://www.sites.ext.vt.edu/newsletter-archive/viticulture/06march/06mar.html
Management of other important diseases in the region
Grapevine leaf roll virus
About 25% of vines with premature senescence symptoms are GvLR
Tested for in clean stock programs
Mealy bug vectored in the vineyard

Grapevine red blotch virus
Newly described disease
About 21% of vines with premature senescence symptoms are GvRB—hard to distinguish from GvLR
Not yet tested for
Graft transmissible; Vector unknown

FACT SHEETS: [http://www.nysipm.cornell.edu/factsheets/grapes/diseases/grape_leafroll.pdf](http://www.nysipm.cornell.edu/factsheets/grapes/diseases/grape_leafroll.pdf)
Crown Gall: Agrobacteria

- A big problem in cold years: facilitated by winter injury
- Kills vines
- Clean stock; avoid cold locations for sensitive varieties

Trunk cankers (many fungi)
- Will reduce longevity of vineyards over time
- Present in ~15% of vines in this region
- Control: clean vines, pruning in the spring / double pruning; minimize harvest / nutrient stress

Pierces disease (a bacteria)
- Southern and eastern shores
- Proximity to woodlots very important
  → Insect vector survives on alternate hosts
- Control: cut out diseased canes

Minor viruses
- Clean nursery stock
Benefits of Proper Canopy Management

Decreased Disease

- Early drying of canopy
- Increased penetration and contact of pesticides
- Earlier ripening
Don’t try this at home!
Traminette 1C-b

What not to do with a hybrid. Note the excessive growth, complete shading of fruiting zone and length of shoots. Time for a good haircut.
How sweet. Good indication of an excessive number of shoots.
Two Words: No Mercy.
Vertical Shoot Positioning (VSP)
- Shoots are placed evenly along cordon
- Note shoot density
- Note placement of catchwires
Not everything is a disease:
Here’s some confusing look-alikes
Symptoms associated with fruit rot and fruit deformation can look a lot like...
It can get confusing because insect and sun damaged fruit can later develop disease, such as sour rot.

Insect damage:
American grape berry moth

Sun / heat damage

Use regular scouting to stay informed
Foliar spot and blight symptoms caused by

**FUNGI**: typically cause small spots

**BACTERIA**: Early color / blight

**VIRUSES**: Early color

**FUNGI**: But can also cause blight
Can look like...

Herbicide damage

Nutrient deficiency

Magnesium left, manganese right.
With magnesium deficiency the margins curl downward, discolouration is more continuous with magnesium deficiency.
Mildew symptoms caused by powdery and downy mildew can look like...
Chemical residue
Decline of young and old vines resulting from root rot, trunk disease, or systemic infections (viruses and bacteria)

Can look like
And in early years, premature senescence can be difficult to differentiate from physiological processes.
Online resources

- Cornell: disease fact sheets, spray guides and yearly newsletter from Wayne Wilcox
  
  [http://www.fruit.cornell.edu/grape/IPMGeneral.html](http://www.fruit.cornell.edu/grape/IPMGeneral.html)

- Virginia tech: Blog by Mizuho Nita, with links to disease fact sheets and spray guides
  
  [http://grapepathology.blogspot.com/](http://grapepathology.blogspot.com/)

- University of Maryland: Small fruit pathology lab, timely updates, fact sheets from Cassandra Swett, UMD Small Fruit Pathologist
  
  [https://www.psla.umd.edu/research/research-lab-pages/swett-lab-berry-pathology](https://www.psla.umd.edu/research/research-lab-pages/swett-lab-berry-pathology)
Books / other resources

• A Pocket Guide for Grape IPM Scouting of Grapes in North Central & Eastern U.S.
• APS Compendium of Grape Diseases
• Guidelines for Developing an Effective Fungicide Spray Program for Wine Grapes in Maryland, 2012 (+ 2013 update)
Thank you
Questions?

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