New Grape Grower Workshop: Basic Disease Management

Presented by:
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Some slides from:
Cassandra Swett
Former UMD Small Fruit Pathologist
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
• Reduce vine vigor → reduced yields
• 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
Mildew symptoms caused by powdery and downy mildew can look like...
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

fruit and rachis infections
remain latent until late
in the growing season, near harvest

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

produced by media services at cornell university for the new cornell cooperative extension provides equal program and
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
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
Putting It All Together

- Use an integrated approach: Proper canopy management, biological controls, good variety selection, sanitation, and fungicides.
- Target fungicide applications on current and near term weather, growth stage, disease pressure and environment.
- Use spray guides to develop an initial plan and modify as the season develops.
- Rotate mode of actions. Pay attention to reports of fungicide resistance in your area.
Putting It All Together

• Expect 5-8 fungicide applications the first and second year
• Expect 12-16 fungicide applications for years 3 +
• Organic grape production is challenging due to the high disease pressure in our area. Organic producers will still need to apply multiple sprays using OMRI approved products
Grapes: Diseases and Insects in Vineyards

Timely Viticulture

Sample Wine Grape Spray Schedule - 2016

2016 New York and Pennsylvania Pest Management Guidelines for Grapes

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The purpose of this Timely Viticulture is to help vineyard grape growers in Maryland to develop an effective fungicide spray program to manage a complex of the major fungal diseases affecting vine and fruit. The table below suggests a simple spray schedule for specific grape varieties within a time frame, based on the assumptions below.

**Assumptions:**
- Downy Mildew likely to affect only certain types of grapes
- Powdery Mildew likely to affect only certain types of grapes
- Other problems to include other types of fungi
- Best products for table: Luna Experience, Pridine
- Best products for wine: Rovral, Dashers, Harden, Kocide 1434, andman
- Best products for powdery mildew: Luna Experience, Quanto
- Varieties being applied are NOT soil-borne

**Disclaimer:** Always read the pesticide label. The label is the law and users must follow all rates and restrictions according to label directions.

<table>
<thead>
<tr>
<th>Target Diseases</th>
<th>Anticipated Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downy Mildew</td>
<td>Very High</td>
</tr>
<tr>
<td>Powdery Mildew</td>
<td>High</td>
</tr>
<tr>
<td>Black Rot</td>
<td>Low</td>
</tr>
<tr>
<td>Erinus</td>
<td>Medium</td>
</tr>
<tr>
<td>Pierce Rot</td>
<td>High</td>
</tr>
<tr>
<td>Chemical name (Fungicide product name)</td>
<td>Anthracnose</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Azoxystrobin (Abound)</td>
<td>+++a</td>
</tr>
<tr>
<td>Bostrol (Fadine)</td>
<td>+++a</td>
</tr>
<tr>
<td>Boscalid + Pyraclostrobin (Pristine)</td>
<td>+++a</td>
</tr>
<tr>
<td>Captan (Captan, Captex, etc.)</td>
<td>+++a</td>
</tr>
<tr>
<td>Coppers and Bordeaux mixture (various)</td>
<td>+++a</td>
</tr>
<tr>
<td>Cyfluanid (Torino)</td>
<td>NA</td>
</tr>
<tr>
<td>Cyprodin (Vanguard)</td>
<td>NA</td>
</tr>
<tr>
<td>Cyprodin + Phalocoril (Switch)</td>
<td>+++a</td>
</tr>
<tr>
<td>Cyprodin + Difenconazole (Inspire Super)</td>
<td>+++a</td>
</tr>
<tr>
<td>Fenoxaprid - pymoxan (Tames)</td>
<td>+++a</td>
</tr>
<tr>
<td>Fenoxaprid (Elevate)</td>
<td>NA</td>
</tr>
<tr>
<td>Fentax (Ferbam)</td>
<td>+++a</td>
</tr>
<tr>
<td>Fenamnoi (Rubigan)</td>
<td>+++a</td>
</tr>
<tr>
<td>Finocaprole (Frestal)</td>
<td>NA</td>
</tr>
<tr>
<td>Fluopyram (Luna Experience)</td>
<td>NA</td>
</tr>
<tr>
<td>Fosaprim (Luna Transquility)</td>
<td>NA</td>
</tr>
<tr>
<td>Iproctox (Revival, Meteor)</td>
<td>+++a</td>
</tr>
<tr>
<td>Kresoxam-methyl (Sovran)</td>
<td>+++a</td>
</tr>
<tr>
<td>Lini Soilfam (dominant application)</td>
<td>+++a</td>
</tr>
<tr>
<td>Mancozeb (various: Pencozeb, Dinace, etc.)</td>
<td>+++a</td>
</tr>
<tr>
<td>Mancozeb (Revus)</td>
<td>NA</td>
</tr>
<tr>
<td>Mancozeb + Difenconazole (Revus: Top)</td>
<td>+++a</td>
</tr>
<tr>
<td>Mefenoxam + Copper (Ridomil Gold Copper)</td>
<td>+++a</td>
</tr>
<tr>
<td>Mefenoxam + Mancozeb (Ridomil Gold MZ)</td>
<td>+++a</td>
</tr>
<tr>
<td>Metolachlor (Vivado)</td>
<td>NA</td>
</tr>
<tr>
<td>Myclobutanil (Rally)</td>
<td>+++a</td>
</tr>
<tr>
<td>Phosphonate (ProPhyt, Phostrol, etc.)</td>
<td>+++a</td>
</tr>
<tr>
<td>Sulfur (various)</td>
<td>NA</td>
</tr>
<tr>
<td>Telocapazole (Elite)</td>
<td>+++a</td>
</tr>
<tr>
<td>Tetraconazole (Mettle)</td>
<td>+++a</td>
</tr>
<tr>
<td>Thiaoaniline-methy (Topspin M)</td>
<td>+++a</td>
</tr>
<tr>
<td>Thioctin (Tiflat)</td>
<td>+++a</td>
</tr>
<tr>
<td>Thiafanazole (Procure and Vittura)</td>
<td>+++a</td>
</tr>
</tbody>
</table>

The efficacy rating: NA = no significant activity, ++ = very limited activity, +++ = limited activity, ++++ = moderate activity, +++++ = good activity, ++++++ = excellent activity.

Resistance (or occasional failure of control) has been observed in some southeastern states, thus, if control failure occurs, it could indicate resistance has developed. The efficacy rating could be impacted by resistance development. If resistance has occurred, use of fungicide in the same class would likewise show resistance, and a substitute fungicide should be considered for pathogen management.

Insufficient data for the pathogen-chemical combination. The rating was given based on the general knowledge on the material.

Sulfur will cause burn on sensitive varieties, especially on hot days, >85F.
<table>
<thead>
<tr>
<th>Crop Stage</th>
<th>Time Frame</th>
<th>Product</th>
<th>Rate/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>½- to 1-inch shoot</td>
<td>April 20</td>
<td>Mancozeb 75DF plus Sulfur</td>
<td>4 lbs. 3 lbs.</td>
</tr>
<tr>
<td>3-5 inch shoot growth</td>
<td>April 27</td>
<td>Captan 50WP plus Sulfur</td>
<td>4 lbs. 3 lbs.</td>
</tr>
<tr>
<td>6-10 inch shoot growth</td>
<td>May 4</td>
<td>Mancozeb 75DF plus Sulfur</td>
<td>4 lbs. 3 lbs.</td>
</tr>
<tr>
<td>12-17 inch shoot growth</td>
<td>May 11</td>
<td>Captan 50WP plus Sulfur</td>
<td>4 lbs. 3 lbs.</td>
</tr>
<tr>
<td>Pre-Bloom (Critical)</td>
<td>May 18</td>
<td>Mancozeb 75DF plus Pristine</td>
<td>4 lbs. 12 oz.</td>
</tr>
<tr>
<td>Post-Bloom First Cover Spray (Critical)</td>
<td>May 25</td>
<td>Captan 50WP plus Luna Experience</td>
<td>4 lbs. 8 oz.</td>
</tr>
<tr>
<td>Second Cover Spray</td>
<td>June 1</td>
<td>Ridomil Gold/MZ plus Switch</td>
<td>2.5 lbs. 12 oz.</td>
</tr>
<tr>
<td>Third Cover Spray</td>
<td>June 8</td>
<td>Presidio plus Revus Top</td>
<td>4 oz. 7 oz.</td>
</tr>
<tr>
<td>Fourth Cover Spray</td>
<td>June 15</td>
<td>Mancozeb 75DF plus Sulfur</td>
<td>4 lbs. 4 lbs.</td>
</tr>
<tr>
<td>Fifth Cover Spray</td>
<td>June 25</td>
<td>Phosphorous acid plus Sulfur</td>
<td>5 pts. 4 lbs.</td>
</tr>
<tr>
<td>Sixth Cover Spray</td>
<td>July 5</td>
<td>Phosphorous acid plus Sulfur</td>
<td>5 pts. 4 lbs.</td>
</tr>
<tr>
<td>Seventh Cover Spray</td>
<td>July 15</td>
<td>Phosphorous acid plus Elevate</td>
<td>5 pts. 1 lb.</td>
</tr>
<tr>
<td>Eighth Cover Spray</td>
<td>July 25</td>
<td>Phosphorous acid plus Sulfur</td>
<td>5 pts. 4 lbs.</td>
</tr>
<tr>
<td>Ninth Cover Spray</td>
<td>Aug 3</td>
<td>Quintec plus Phosphorous acid</td>
<td>4 oz. 5 pts.</td>
</tr>
<tr>
<td>Tenth Cover Spray</td>
<td>Aug 13</td>
<td>Captan 50WP</td>
<td>3 lbs. 3 lbs.</td>
</tr>
<tr>
<td>Eleventh Cover Spray</td>
<td>Aug 23</td>
<td>Phosphorous acid plus Captan 50WP</td>
<td>5 pts. 3 lbs.</td>
</tr>
<tr>
<td>Pre-harvest</td>
<td>Sept 3</td>
<td>Phosphorous acid plus Captan 50WP</td>
<td>5 pts. 3 lb.</td>
</tr>
</tbody>
</table>
Online resources

• Cornell: disease fact sheets, spray guides and yearly newsletter from Wayne Wilcox
  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/

• 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
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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