Vineyard Disease Management for Cold Climate Grapes

ANN HAZELRIGG
UVM EXTENSION
NY/VT GRAPE SCHOOL
LAKE GEORGE, NY
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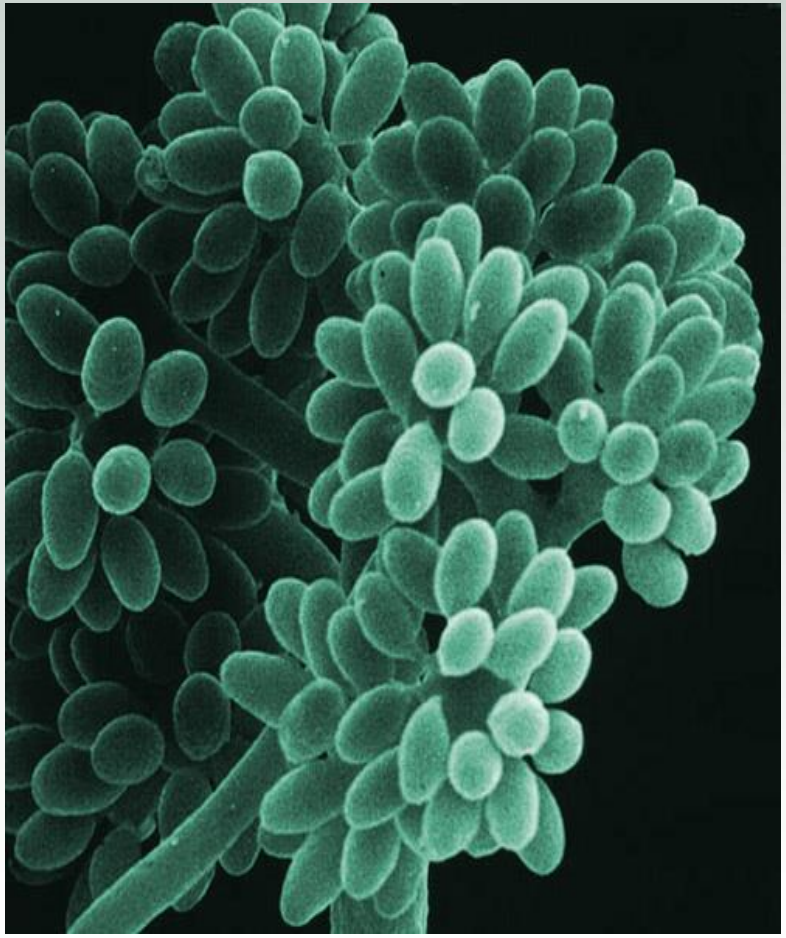
Major Grape Diseases:

- Black rot
- Phomopsis cane and leaf spot
- Powdery mildew
- Downy mildew
- Anthracnose
- (Botrytis)

Botrytis/Gray Mold-weak pathogen, likes high RH and poor air circulation. Minimize through canopy management

Field view

Hand lens



Microscope

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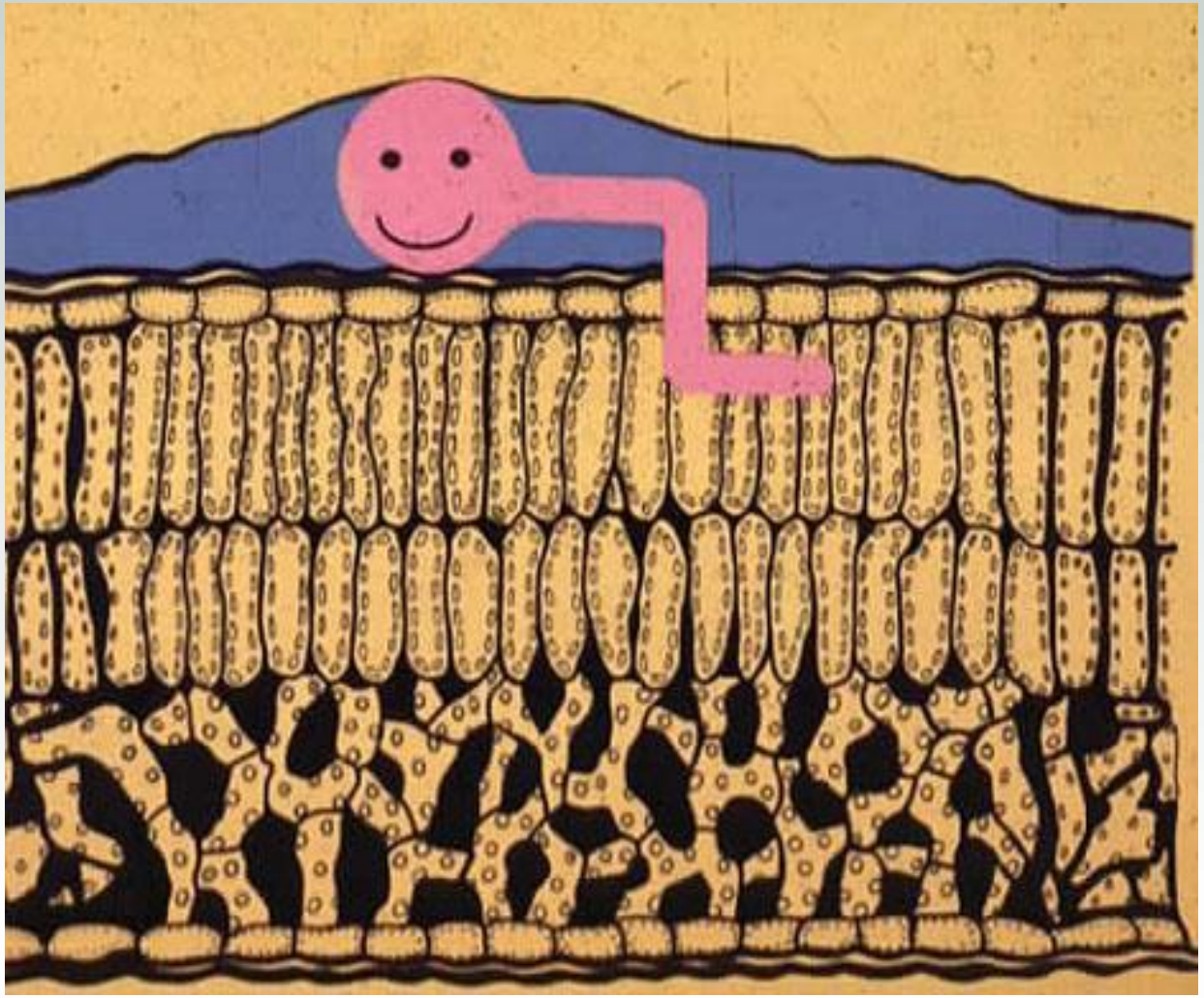
6-8 hours of leaf wetness or high RH



3X0090 [RM] © www.visualphotos.com

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More airborne spores that repeat cycle

Overwintering phase in the vineyard

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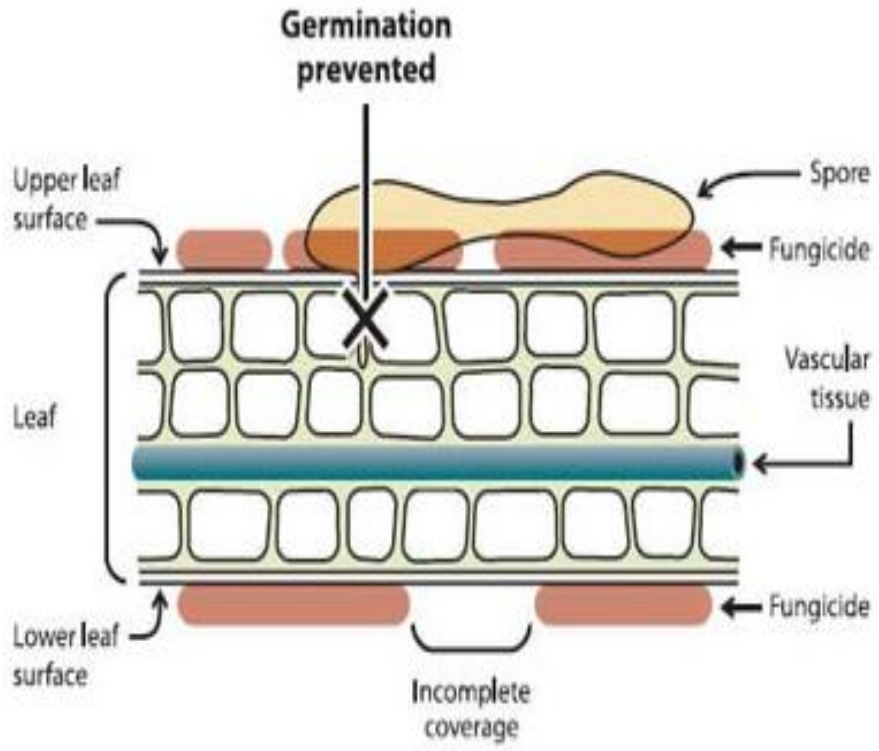
Protectant fungicides provides a “barrier” to the spore. Will weather and wash off in 1-2 inches of rain



Mode of action of protectant fungicide (www.agr.gc.ca)

Black rot-most serious grape disease in E. US. Attacks all green parts of the vine.

Leafspots-1/4 inch and larger

Cankers on stems

Berry Rot

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Berry rot is most economically damaging

- **Disease OW on mummies in canopy- produce one type of spore. FINITE SPORE LOAD.**
- Pathogen likes warm (70-80 F), wet conditions. Spores are released in rainy weather in the high 70s-low 80s and infect ALL TISSUE-leaves, shoots and developing berries where **repeating** secondary spores develop.

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Berry Rot

- Shrivel and turn to raisins and **remain firmly attached**
- Black rot fungus **only infects green berries** and will not infect berries after they start to mature, they become more resistant
- Most vulnerable from cap fall until 3-4 weeks later in Concord until highly resistant at week 5-6. (Tricky because infections remain latent for weeks).
- Excellent control with sprays applied right at the start of bloom plus 2 and 4 weeks later.
- If you keep foliage/berries protected for this time period, there will be **no secondary spread** from the disease because overwintering spore load is long gone and nearly all leaves and berries (the potential sources of “repeating” spores) are clean in the vast majority of commercial vineyards
- Once you see it in the berries it is too late!- secondary spread.

Disease management for all infectious diseases

NEED ALL 3 PRESENT-i.e. susceptible host, presence of the pathogen and conducive environmental conditions for disease to occur.

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Black Rot Management

- **PATHOGEN:** Remove all mummies in canopy and cultivate/mulch to reduce floor inoculum if disease was severe previous season, select fruiting canes without lesions – **sanitation is critical** especially in organic

- **ENVIRONMENT:** Canopy management to encourage drying, good orientation of rows

- **HOST:**

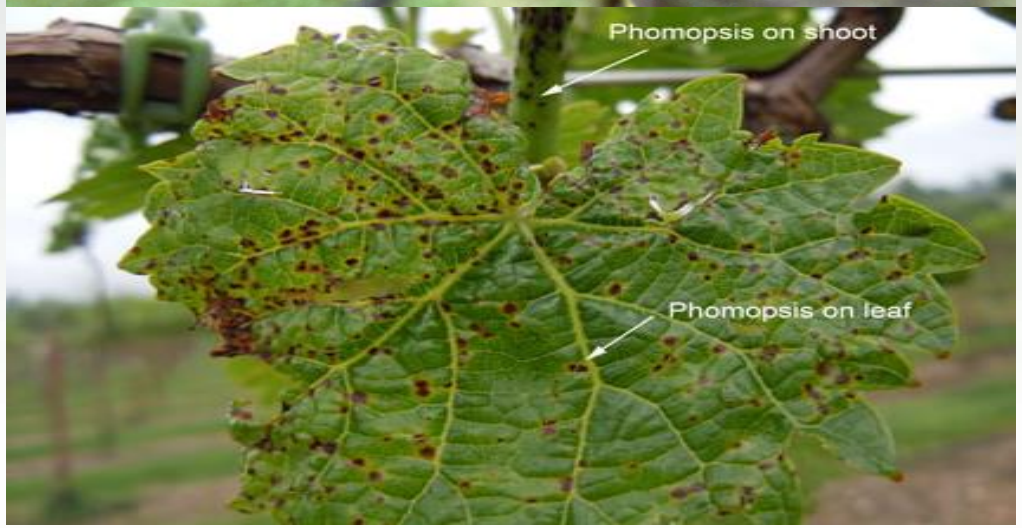
1) Cultivar selection

2) Fungicides to protect clusters-easy to control with conventional fungicides at immediate pre-bloom and 2 post bloom applications (fruit becomes more res. after this). WW-If more than a trace level of black rot is observed, sprays should continue through end of July if conditions are suitable for infection (ie wet)

Cultivar susceptibility to Black Rot

	Black Rot [1]							
	2014				2015			
Cultivars	% Inc. [2]		% Sev. [2]		% Inc.		% Sev.	
Corot Noir	1.67	ab	0.04	ab	8.33	cd	0.20	bc
Frontenac	0.00	b	0.00	b	68.33	a	1.83	a
La Crescent	10.00	a	0.23	a	20.00	bc	0.47	abc
Marquette	3.33	ab	0.08	ab	43.33	ab	2.65	a
Prairie Star	8.33	ab	0.20	ab	45.00	ab	1.21	ab
St. Croix	0.00	b	0.00	b	0.00	d	0.00	c

Phomopsis-attacks all parts of the grape plant



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Phompsis-rachis infections cause most economic damage

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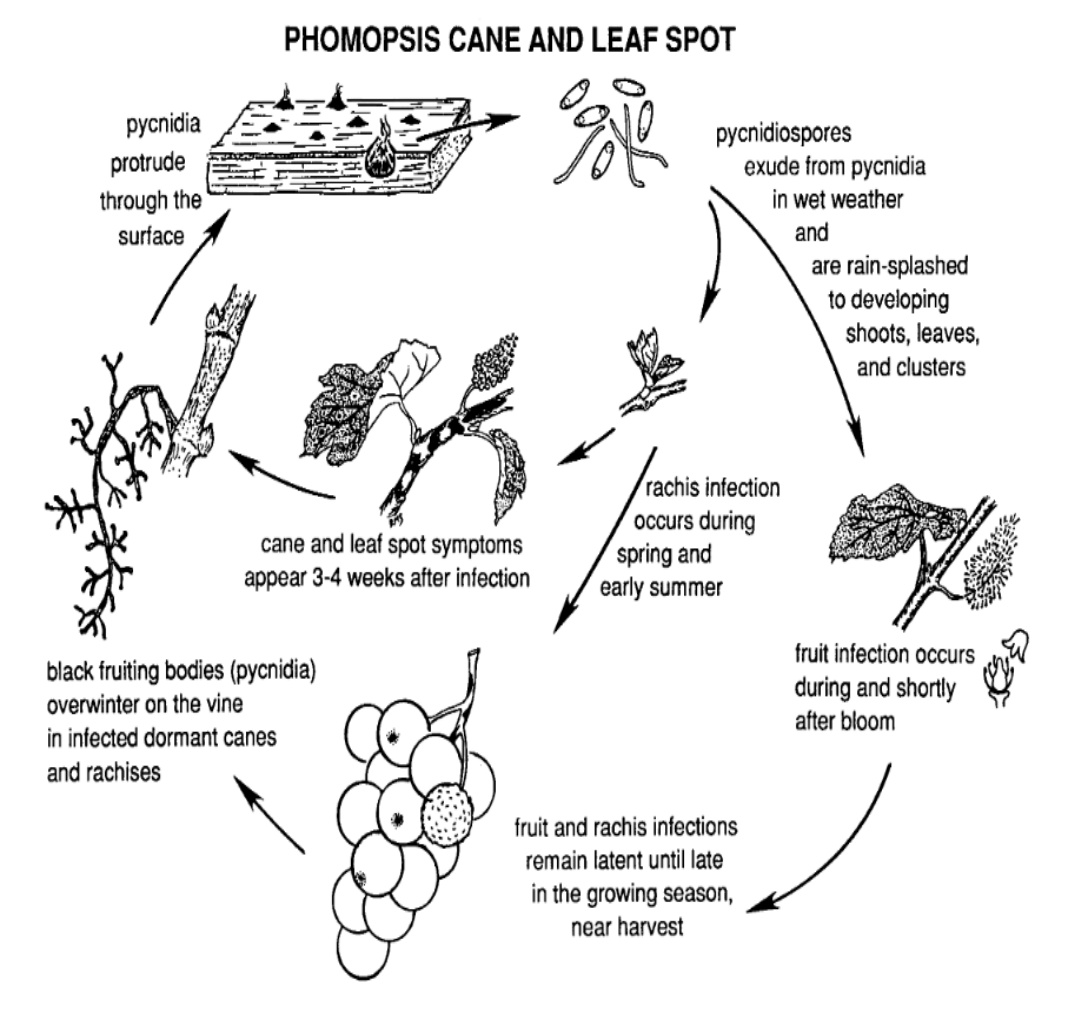
Phomopsis



- Overwinters on diseased canes
- Spores produced during wet weather can infect anytime
- Unlike black rot, fruit rot symptoms caused by *Phomopsis* generally do not appear until close to harvest on mature fruit
- However, fruit rot at harvest may be due to infections at bloom

Phompsis vs Black Rot on berries

Phomopsis lesions typically start where berry is attached to stem and do not appear until late summer or early fall. Detach easily. Sparse fruiting bodies.

Black rot lesions start at random locations on berry and appear by late July or early August. Hard to detach.

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Phomopsis Management

Pathogen: Sanitation is KEY!-remove diseased canes and or brush piles to reduce pathogen inoculum.

Environment: sites with direct, all-day sunlight, good soil drainage/ air circulation. Orient rows to take advantage of sunlight and wind movement. Any cultural practices that increase air circulation and light penetration will reduce wetting periods to reduce infections.

Host: EARLY Protectant sprays of fungicides beginning at 1 inch shoot growth if high pressure or at least by 3-5” and repeated throughout season. Clusters should be protected as soon as they first become visible, about 3 inches of shoot growth or to control disease on the rachises.

Black scabby lesions on stems

Anthracnose

Sunken lesions

All succulent parts of the plant (fruit stems, leaves, petioles, tendrils, young shoots, berries) are susceptible

Lesions on shoots and berries are most common and distinctive.

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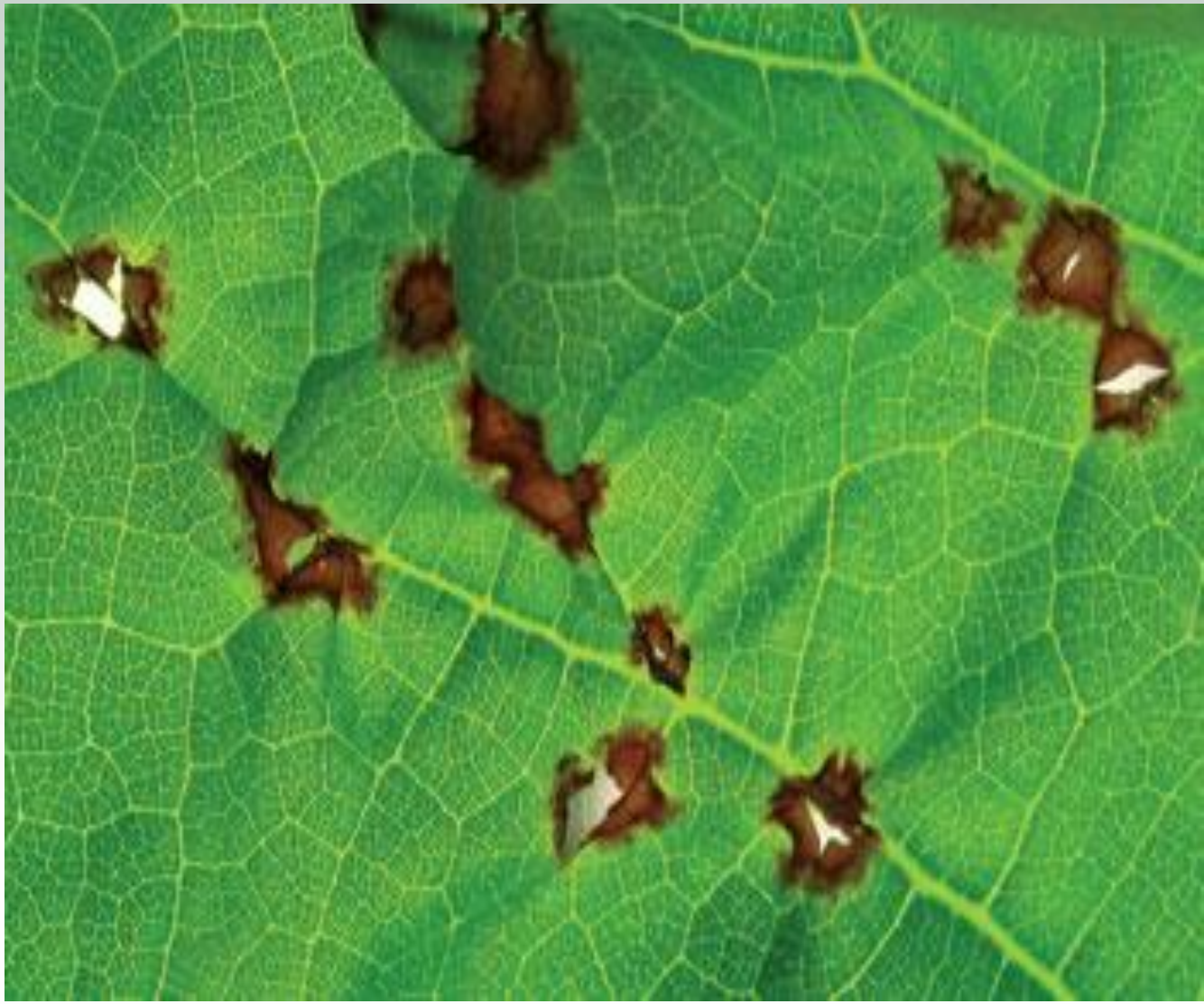
Anthracnose

- Overwinters on **infected shoots/berries**
- Conidia spread by splashing rain to new tissues
- Young leaves/berries more susceptible than older leaves/berries
- Heavy rainfall and warm temps favor disease
- Clusters are susceptible to infection before flowering and until veraison.



Anthracnose Management

Pathogen: Sanitation-eliminate diseased parts during dormant season to reduce inoculum, rogue wild grapes

Environment: Canopy management-increase air circulation/drying by shoot and leaf removal and training system

Host

- **Varietal selection**- Marquette appears to be particularly susceptible, although Frontenac and La Crescent also have been affected
- **Fungicide Use** -Dormant application of liquid lime sulfur in spring followed by regular applications of fungicides

Powdery Mildew

- Overwinters in grape bark
- Amount of disease directly related to amount of OW inoculum so manage through fall to lower spring amount
- Affects all green tissues
- Easy id by covering of white/grayish powder typically on upper but can also be lower-baby powder
- Severe leaf infection can cause cupping, drying and premature drop

Powdery Mildew

- Infected berries may not ripen properly, may split or drop
- High humidity 85% optimum/cloudy conditions favors the disease
- Easily can turn into an epidemic if 60-80 degrees with new generation every 5-7 days
- Cold nights can seriously set the fungus back while it’s trying to ramp up in the spring

Powdery Mildew Management

Pathogen: Amount of disease directly related to amount of OW inoculum so manage through fall to lower spring amount

Environment:

- Canopy Management-Sun exposure, decrease RH by leaf pulling, shoot positioning
- Weed management

Host: Fungicide applications: organic has some efficacy. Critical time to control fruit infection with fungicides is from **immediately prior to bloom** through **two to four weeks after bloom**. Even though the berries become resistant with age, cluster stems and leaves remain susceptible throughout the season

Powdery Mildew- WW annual reminder:

Berries are extremely susceptible to infections initiated between the immediate pre bloom period (when the fungus establishes on the tiny flower stem, from which it later expands onto the developing fruit) and fruit set, after which they become highly resistant to immune about 2 weeks (Concord) to 4 weeks (*V. vinifera*) later.

“This is when you use the good stuff and don't even think about cutting corners in terms of spray frequency and application technique.”

Downy mildew- leaves lose susceptibility once fully expanded

Fungus-like organism that can infect berries, leaves and young shoots, more cottony than baby powder

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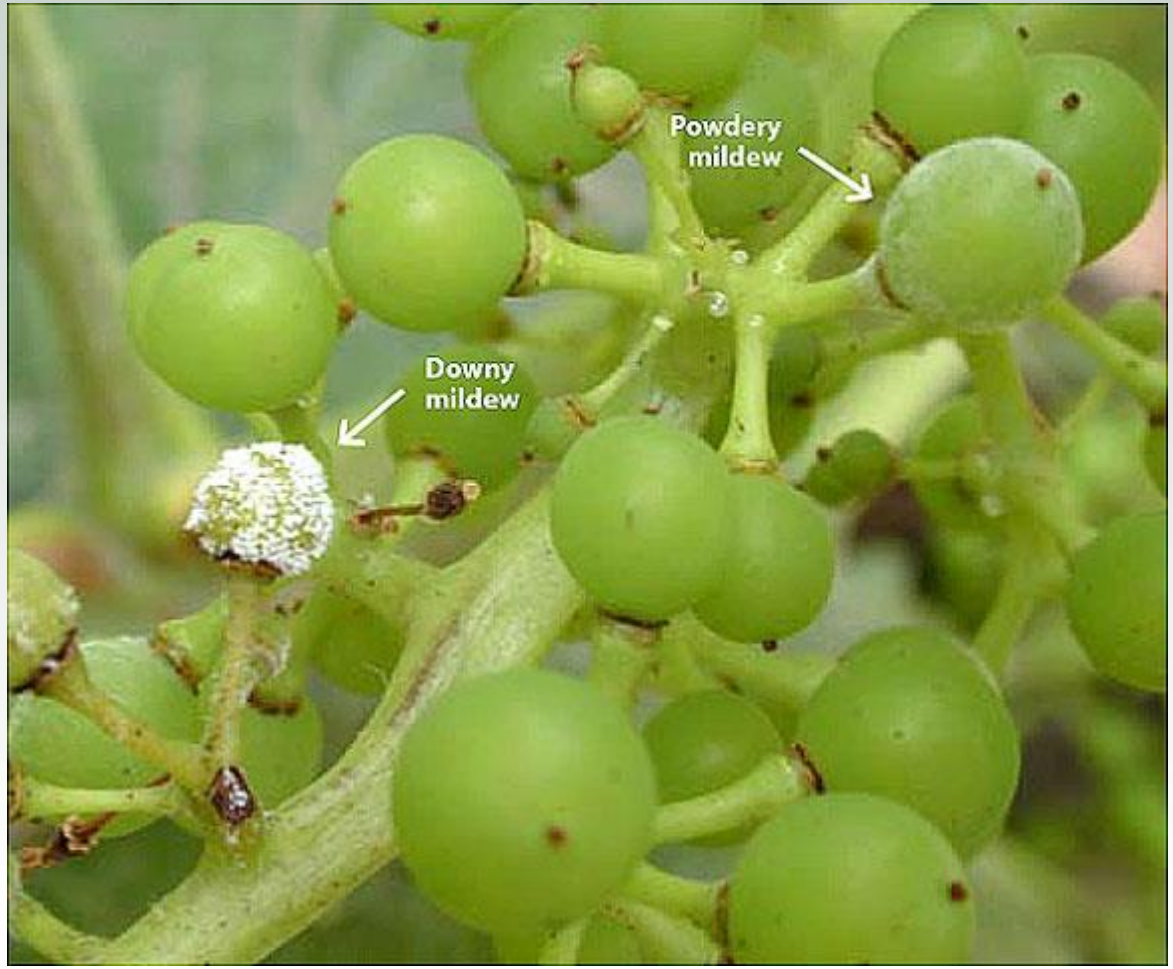
Downy Mildew-likes wet and high humidity-if protection is lacking and the weather remains favorable -repeated humid nights, frequent rains, and extended periods of cloudy weather the disease can explode! Spores will die in bright sunlight.



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Keep berries protected until a month after cap fall dep. on cultivar and weather. Fruit loses susceptibility to infection by midsummer.

Downy Mildew

- OW in the soil as resting spores (oospores) that form within infected leaves and berries. The more infection last year, the more oospores this year.

- Once primary infections develop, new "secondary" spores (sporangia) form in the downy growth visible on infected young clusters and the leaf undersides.

- Rapid spread if warm (70 F) humid nights with rain. Without rain, most of the un-germinated sporangia will die the next day but can survive for several days between rainfalls if conditions remain cloudy, which helps to keep an epidemic running.
- Eventually, severely infected portions of plant wither and die. Premature defoliation can predispose vines to winter injury.

Downy Mildew Management

Pathogen: reduce ow inoculum on vineyard floor, spring cultivation to bury fallen leaves

Environment: Any practice that improves air circulation and speeds drying w/in canopy will help

Host: Fungicides-to prevent early disease establishment and cluster infections during the pre-bloom and early post-bloom periods, limiting secondary spread on the foliage during the summer

Disease Management Basics

- SCOUT-foliar issues can indicate inoculum pressure
- Get ID
- Keep track of diseases for one season since they will indicate amount of inoculum for the next season-record keeping
- Sanitation is key for all the diseases!
- Canopy management to increase air circulation and drying
- Most of the diseases need protection during the critical time of pre-bloom and 2 post bloom sprays
- Be aware of FRAC codes to avoid increased pathogen resistance

Proper identification is key!

ID can be tricky, especially in clusters. May have more than one disease/problem. Send a sample to your state's diagnostic clinic:

UVM Plant Diagnostic Clinic

Jeffords Hall, UVM

105 Carrigan Drive

Burlington, VT 05405

ann.hazelrigg@uvm.edu

802.656.0493

http://pss.uvm.edu/pd/pdc/

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Cornell Plant Diagnostic Lab

Cornell Plant Diagnostic Lab

Karen Lynn Snover-Clift
324 Plant Science Building
Ithaca, NY 14853

Phone: (607) 255-7860

Fax: (607) 255-4471
kls13@cornell.edu

http://plantclinic.cornell.edu/

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