Early season grape disease management

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Phomopsis viticola

• Over-winters on canes/old rachises and tendrils, live/dead wood
• Spores spread by spring rain
• Most infection occurs early…
• Disease development dependant on overwintering inoculum load
Phomopsis viticola
Phomopsis viticola
Phomopsis signs and symptoms

- Black, scabby, lesions
- Shoot/rachis becomes brittle, leads to fruit infection
Reduce presence of pathogen; Spur vs cane prune (also br, pm)

• Spur pruning
  - requires cordons
  - retains more old wood
  - retains more inoculum (pathogen source)

• Cane pruning systems
  - Minimizes older wood
  - Minimizes over-wintering inoculum
  - inoculum source is below trellis wire
Trellis systems: reduce suscep/environ (also br, pm)

- High wire, no tie
  - juice, hybrid wine
  - 3D

- Vertical shoot position
  - hybrid, *vinifera* wine
  - 2D (aeration, sunlight, fungicides)

- Shred prunings
Phomopsis; Chemical Management

- **Seasonal sprays of Captan, Mancozeb, Ziram;**
  - inexpensive and effective
  - protect shoots, rachises at first emergence
  - Immediate pre-bloom and 1st post-bloom sprays critical for fruit infections.

- Few spores available by mid July; infection risk low after pea sized berries (MSU and Cornell).
Black rot: *Guignardia bidwellii*

Leaf lesions appear 2 weeks after infection.
Black rot symptoms

Lesions appear 2 weeks after infection in spring

Dark pycnidia within lesions
Black rot

- Tan (chocolate milk) spots on berries
- Berries turn dark brown with numerous pycnidia
Black Rot; Biology/Disease Cycle

- Over-winters in infected fruit and wood on ground and in trellis.
- Spores released by rain, splashed to green tissue.
- New infections may produce inoculum in 2-3 weeks.
- *Most fruit infection from secondary sources.*
Black rot

- Leaf and shoot tissue susceptible as long as still expanding.
- Fruit very susceptible from start of bloom to 3-4 (Concord) to 4-5 weeks (v. vinifera) after bloom.
- Fruit highly resistant by 6 (Concord) to 8 (v. vinifera) weeks after bloom.
Cultural/Chemical control of black rot

• Reduce pathogen (sanitation)
  - remove fruit mummies; potent sources of inoculum
  - chop, plow, till into soil.

• Reduce environment/host susceptibility: Maximize air, light, pesticide penetration into fruit zone and canopy

• Fungicides:
  - Sterol inhibitors; (Rally, Elite, Mettle, Rhyme, Inspire Super/Revus Top)
  - Strobilurins; (Flint, Pristine, Sovran, Abound)
  - SDHIs (Miravis Prime)
  - Old Standards: Mancozeb, Ziram, Captan
  - Organic?...copper formulations
Scouting for black rot
Scouting for black rot
Powdery mildew: *Uncinula necator*
Powdery mildew signs and symptoms; Leaves
Powdery mildew Signs and Symptoms; Fruit

Infections at bloom can cause poor fruit set
Powdery Mildew; Primary Infection Cycle

- Chasmothecia overwinter in bark
- Swell, split open during spring rain, ascospores released (0.1” rain, >50F)
- Ascospores blown to emerging tissue
- Can infect wet or dry tissue.
- Ascospore supply exhausted shortly after bloom.
• Spores (conidia) from primary infections wind dispersed

• **Rainfall not required**

• Generation time only 5-7 days under ideal conditions (constant 60s-80s°F; 85% RH)
Powdery Mildew Management; Fruit

- **Peak** fruit susceptibility period is limited
  - **Concord:** immediate pre-bloom to 2-3 weeks post bloom
  - **Sensitive hybrids and vinifera:** immediate pre-bloom to 4 weeks post bloom

- Best materials
- Full rates
- Best coverage
- Tightest intervals
Powdery mildew infections on fruit....rots later

• Protect fruit for 3-4 wks after capfall.
• Early infections = severe mildew, splitting.
• Late infections = diffuse infections, “invisible”
  - breaches, dead zones in skin
  - exacerbates fruit splitting
  - provides opportunities for rot fungi.
Powdery Mildew; Cultural Control

- Reduce environment:
  - leaf removal/shoot thinning to maximize air circulation, sun exposure, pesticide penetration, reduce RH
  - good weed control
  - nutrient management/cover crops to limit canopies

- Reduce susceptibility - delay summer hedging with palissaging, minimize regrowth
Powdery Mildew; Chemical Control

- **Strobilurins**: Flint/Flint Extra, Sovran, Abound, Pristine
  - Combos: Luna Sensation, Quadris Top, Topguard EQ
  - Resistance widespread; not recommended!

- **Sterol inhibitors**: Rally, Elite/Orius/Tebuzol, Mettle, Procure/Viticure/Trionic, Rhyme, Topguard EQ, Cevya
  - Combos: Inspire Super/Revus Top/Quadris Top (difenoconazole), Luna Experience (teb)
  - Efficacy slipped due to resistance; restrict use to outside of critical fruit protection period.
Powdery Mildew; Chemical Control

- Quintec (quinoxyfen)
- Vivando/Prolivo (metrafenone/pyriofenone)
- Torino (cyflufenamid)

- SDHIs: Succinate dehydrogenase inhibitors
  - Endura (boscalid)
  - Luna Experience (fluopyram + tebuconazole), Luna Sensation (fluopyram + trifloxystrobin)
  - Aprovia (benzovindiflupyr/solatanol)
  - Aprovia Top (+ difenoconazole)
  - Miravis Prime (pydiflumetofen + fludioxinil)
Powdery Mildew; Chemical Control
Old standards, Alternatives

- Sulfur, lime sulfur
- Copper and lime
- Monopotassium phosphate (Nutrol)
- Potassium bicarbonate (Kaligreen, Armicarb, Milstop…)
- Oils (Stylet, Purespray, Ultra-fine, soybean, etc…)
- Plant extracts - EF400, Vineyard Magic, GC-3, Citrex, Sporan, Regalia
- Biologicals: Bacillus bacteria (Serenade, Sonata, Taegro, Double nickel, etc.
- OSO, PH-D, Tovano (polyoxin D zinc salt)
Downy Mildew: *Plasmopara viticola*

- Yellow "oil spots" in spring
Downy Mildew Signs and Symptoms; Underside of Leaves

Downy sporulation on underside of leaf
Downy Mildew; Shoots

Tissues thicken

White downy sporulation

Tissues blacken and die
Downy Mildew; Primary Cycle

- Over-winters as oospores in infected leaves on vineyard soil
- **Primary cycle; 5-6 leaf stage to fruit set**
  - spores released at 0.1” rain, >52F
  - splashed from soil to canopy
  - requires wet leaf surface for infection
Downy Mildew; Secondary Cycles

- Infections sporulate at night, >95% RH
- Spores blown to wet plant surfaces, infect
- 4-5 day generation time under ideal conditions
- Epidemics occur in warm, wet summers
- Hot, dry weather inhibits development
Downy Mildew; Management

• Leaves can be infected all season; less susceptible after fully expanding

• Clusters susceptible as soon as pathogen is active (5-6 leaf stage).

• Fruit resistant 2-4 weeks after bloom but...

• Rachises still susceptible after fruit are resistant (2-3 weeks longer?)
Downy Mildew; Cultural control

- Reduce environ/suscep
  - appropriate trellis, canopy management
  - good air, soil drainage
  - good weed control

- Reduce pathogen
  - light spring cultivation to bury overwintering inoculum
  - early sucker control
Downy Mildew; Chemical control

- Old Standards: mancozeb, captan, ziram, copper/lime
- Gavel 75DF: zoxamide (22) + mancozeb
- Ridomil (w copper or mancozeb); mefanoxam (4)
- Phosphites/phosphorous acid (Rampart, ProPhyt, Phostrol, Fosphite, Reveille, etc)
- Revus 2SC (mandipropamid; 40)
- Ranman; cyazofamid (21); effective alone and mixed with phosphorous acid.
- Zampro: New in 2013, Initium (45) + dimethomorph (same FRAC (40) as Revus)
- *Bacillus mycoides*: LifeGuard (?)
- Strobilurins: (11) Flint, Sovran, Pristine, Abound
- Reason 500 SC; fenamidone (11); dm control only
Newer fungicides to consider in 2020

• **Aprovia** (benzovindiflupyr: Syngenta)
  - *Powdery mildew (good/excellent)*
  - Black rot, Botrytis (modest/suppression)
  - Phomopsis?
  - FRAC code 7: SDHI (same code as boscalid (Endura, Pristine), fluopyram (Luna))
  - 12 hour REI, 21 day PHI
Newer fungicides to consider in 2020

- **Aprovia Top** (benzovindiflupyr + difenoconazole: Syngenta)
  - *Powdery mildew, Black rot* (good/excellent)
  - Phomopsis?
  - Botrytis (modest/suppression)
  - FRAC code 7: SDHI (same code as boscalid, fluopyram)
  - FRAC code 3: Sterol inhibitors
  - 12 hour REI, 21 day PHI
Newer fungicides to consider in 2020

• **Intuity** (mandestrobin: Valent)
  - Powdery mildew (suppression)
  - *Botrytis (fair to good)*
  - FRAC code 11: related to strobies
  - Restricted in NY (not for Long Island)
  - No sequential apps/rotate with non-FRAC 11, max 3 apps/season
  - **Do not use** on V. labrusca, V. labrusca hybrids, non-vinifera hybrids
  - Avoid mixing with organosilicone surfactants
  - 10 day PHI
Newer fungicides to consider in 2019

- Fracture
- Biopesticide with novel active ingredient; a polypeptide derived from Lupines.
- Binds with and ‘fractures’ chitin in fungal pathogen cell walls.
- Fair to good powdery mildew and Botrytis/bunch rot control.
Newer fungicides to consider in 2020

- **Miravis Prime**: pydiflumetofen + fludioxonil
  - *Powdery mildew, black rot, Botrytis*.
  - FRAC group 7: SDHI (same code as Boscalid (Endura, Pristine), fluopyram (Luna), benzovindiflupyr (Aprovia))
  - FRAC group 12: fludioxonil (older, unrelated to anything)
New fungicide for 2020

• **Cevya**
• FRAC 3: sterol biosynthesis inhibitor
• mefentrifluconazole
• *Good to excellent on powdery mildew*
• Label restrictions: no use on *Vitis labrusca* hybrids.

• Black rot?
New fungicide for 2020

• **Gatten** - Powdery mildew
• FRAC group U13: new class of active ingredient
• *Excellent results on pm in NY trials*
• 12 hour reentry, 14 day PHI
Newer formulations to consider

- **Luna Sensation**: fluopyram (7) + trifloxystrobin (11) – br, pm, phom, maybe dm suppression
- **Dexter Max**: Mancozeb + Azoxystrobin (11) – br, dm, pm, phom

- **Trionic** (triflumizole; (3) – pm, similar to Viticure
- **Rhyme** (flutriafol; (3) – br, pm
- **Topguard EQ** (flutriafol + azoxystrobin, (11) – br, dm, pm, phom
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