

Identification and Management of Late Season Grape Rots

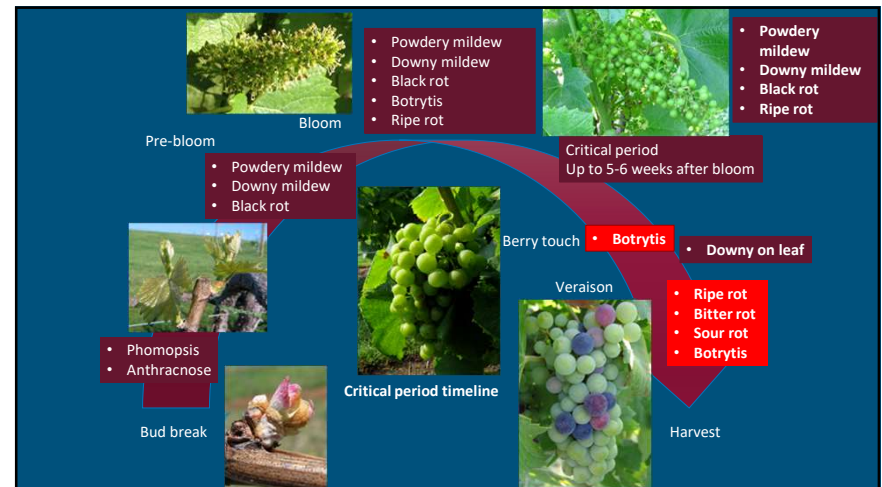
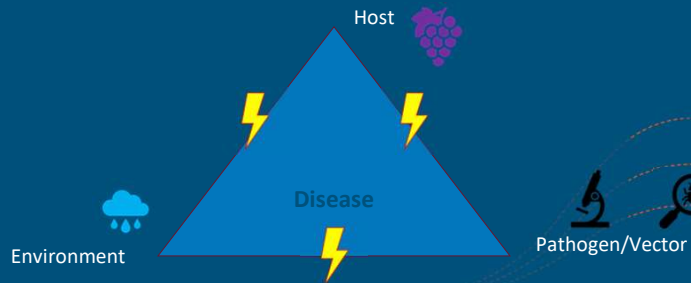
Mizuho Nita (me-zoo-jo, or rhyme with Navajo)
 For 2023 Ohio Grape & Wine Conference
 A pdf version will be available on my blog
 (ext.grapepathology.org)



Issues with late-season grape rots

- Difficult to differentiate: They all look alike!
- Symptoms appear so close to harvest: No time to spray, and limited in spray materials!

The management of disease = aiming to break the disease triangle



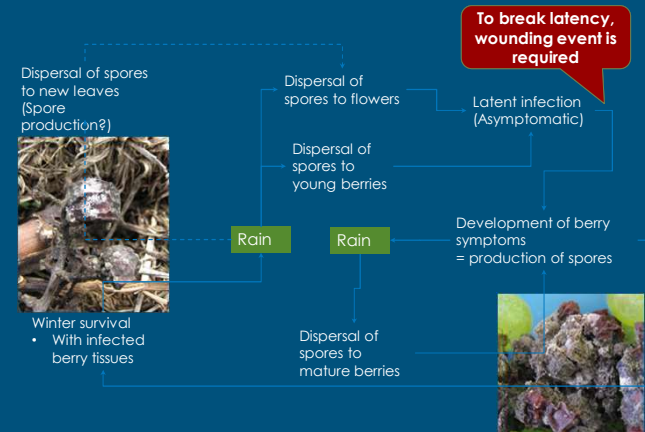
Botrytis Bunch Rot



This could be other rot too. Macrophoma rot, sour rot, etc...



Disease cycle of Botrytis bunch rot



Botrytis Management

- Cultivar selection (i.e., red-fruited cultivars are less susceptible)
- Good air circulation/Canopy management
 - Long wetness event (> 15 hr) is often associated with disease development
- Cluster management (excessive leaf removal to promote reduce compactness, e.g., Violes)
- Management of powdery mildew and insect (GBM) early in the season to avoid wounds

Bottom line for Botrytis management

Timing of fungicide application

- Pre-bloom: **Powdery mildew** management!
- At bloom: protect flowers with one of Botrytis materials plus, GBM, if necessary
- Post bloom: the major spray timings are at bunch closure (the last opportunity to deliver fungicides inside of the cluster) and at veraison (spore availability)
- Injury management (**GBM**, Birds)

Botrytis Management Preventative fungicide options

- Group 2: iprodione (Rovral/Meteor – resistance = low/mod risk),
- Group 7 (SDHI): boscalid (Endura), Luna Experience, Kenja, Miravis Prime (– resistance = high)
- Group 9: cyprodinil (Vanguard, Inspire super, Switch- resistance = mod)
- Group 12: cyprodinil + fludioxinil (Switch – resistance = mod)
- Group 17: fenhexamid (Elevate – resistance = unknown)
- Group 19: polyoxins (Oso, Ph-D – resistance = mod)
- Group M4: captan – fair activity, but it will be a good mixing partner!
- Group M1: copper (the same comment as above)
- Please rotate among different mode of action (FRAC) groups
- These fungicides were tested for curative activity in the lab. They had some efficacy within 12 hr of infection; however, it is a lab experiment using detached berries (i.e., I wouldn't risk your vines.)

Known fungicide resistance issue Botrytis gray mold (from the Baudoin lab)

Probability of resistance development

Very high risk

- Flint (and other QoI, 11)

High Risk

- Endura (7) and Pristine (7 + 11)

Moderate

- Rovral (2), Meteor (2) , Vanguard (9), Scala (9),

Unknown

- Elevate (17)

Level of resistance if you find them

High

- Flint

Moderate to high

- Endura and Pristine

Moderate

- Vanguard and Scala

Low

- Rovral

SKIP

Questions from growers

Will new SDHI materials any better than Endura/Pristine?

- Yes, due to different delivery mechanisms
- You can expect a new material to work even if you had Endura-resistant Botrytis

Will new SDHI materials be prone to development of fungicide resistance?

- Yes. Please tank-mix.

Will iprodione be available for grapes in the future?

- Yes, but with more restrictions. At this point, the EPA will change the limit of application to once a season.
- Timing of the change is still unknown, but please read the label when you purchase a new iprodione product!

Ripe rot

- Caused by *Colletotrichum* species.
- We found the average of 2.7 species per vineyard in our previous survey.
- They vary in the level of susceptibility against fungicides.



Ripe rot

- Cultivar susceptibility varies
 - Susceptible: Chardonnay, Traminette, Cabernet Sauvignon, Cabernet franc
 - Less susceptible: Merlot, Petit Manseng
 - **However**, even with less susceptible cultivars, we have seen outbreaks...
- Very inconsistent field test results when we rely on one product (10 modes of action tested)
 - Probably due to multiple species in the vineyard
 - We found the average of 2.7 species/vineyard in VA



Mixing multiple MOA is the key for ripe rot management; however,...

Mixing partners for mancozeb/ziram or captan (Timing: bloom, veraison, + 7-10 days after veraison)

Moderate level of reduction	Low level of reduction	No or limited effect
<ul style="list-style-type: none"> • Aprovia (Benzovindiflupyr, FRAC= 7) • Cueva (Copper (M1)) • Intuity (mandestrobin, (11)) • Viathon (Phos acid (33) + tebuconazole (3)) • Switch (cyprodinil (9) + fludioxonil (12)) 	<ul style="list-style-type: none"> • Elevate (fenhexamid (17)) alt. w/ Rovral (iprodione (2)) • PhD (polyoxin-D (19)) • Luna Experience (Fluopyram (7) + tebuconazole (3)) 	<ul style="list-style-type: none"> • Endura (Boscalid (7)) • Oso (polyoxin-D (19)) • Rally (myclobutanil (3)) • Miravis (Adepidyn (7))

The same MOA provided different level of control...

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Resistance issue with Qol fungicides...

Ripe rot field trials 2020-22

Give the difficulty, we decided to check "alternative" options to enhance conventional chemicals.



Biofungicides: Biological control agents and plant defense activators

- These are different from conventional fungicides in many aspects.
 - Competition, interruption, predation, antagonistic, or turn on plants' defence mechanisms
- **Preventative application is the best practice.**
 - We need to set the stage for them before pathogens come in contact with the host.
 - These won't work after you see diseases.



Ripe rot trial 2020-22

Biological agents: Howler (7 lb, AgBiome), Theia (3 lb, AgBiome)

Nutrients: Kendal (3qt, 3-0-15, Helena/Valagro) and LoKomotive (4 qt, 2-0-25, Loveland)

Plant defense activator: Actigard (57g, acibenzolar-S-methyl, Syngenta), Lifegard (128g, *Bacillus mycoides* isolate J, Certis) (and Kendal)(Vacciplant was also tested, but did not work well against ripe rot)

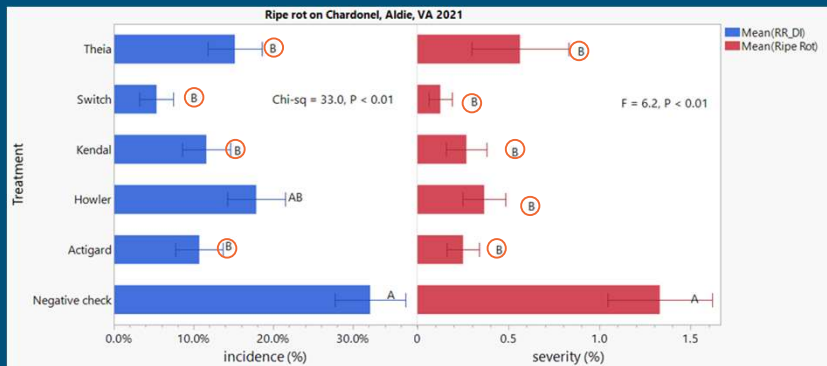
Fungicide: Switch (13 oz, Syngenta)

- Applied from prebloom to veraison in 14-day interval, rating at harvest
- In 2022, combinations of promising materials were applied at prebloom, veraison, and 2 weeks after veraison

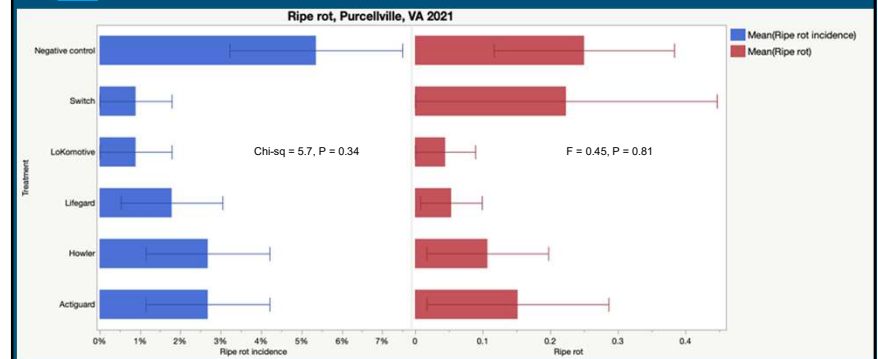
Location: AHS AREC (Winchester), Purcellville, VA, and Aldie, VA

- At Purcellville and Aldie, our treatments were applied in addition to grower's standard management.

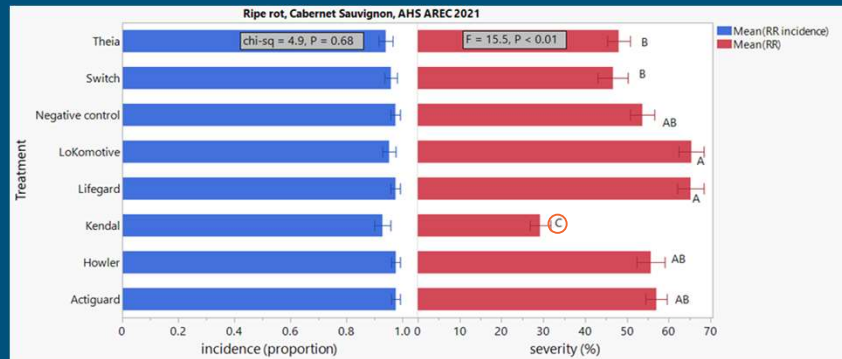
Nearly all treatments resulted in significantly lower ripe rot incidence and severity at Aldie in 2021



Very low ripe rot at Purcellville, VA (no significant treatment effect), but all treatments were numerically lower in incidence.



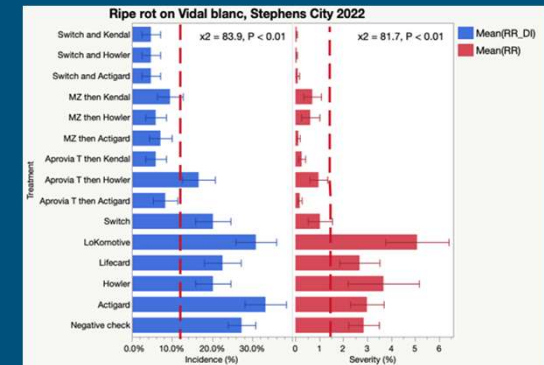
Ripe rot outbreak at AHS AREC plot in 2021 and 22



Combination of “better” materials worked well.

Timing: bloom, veraison, 2 weeks after veraison

- Aprovia Top, Mancozeb (MZ) were applied only at bloom
- We will examine combinations of Howler, Kendal, and Actigard in 2023



Ripe rot trials summary

Ripe rot

- At low to medium level of ripe rot, all (but Howler on disease incidence) significantly reduced ripe rot.
- At high level of ripe rot, Kendal (3-0-15) suppressed the disease three years in a row (2019 - 2021). In 2022, Kendal treatment suppressed black rot.
 - Kendal claims that it can act as a plant defense activator
 - Application of potash may not be favored by winemakers.
- Combination of Mancozeb, Switch or Aprovia plus Howler or Kendal looked promising.



Ripe rot chemical management

Timing of application

- Timing: at bloom and veraison, plus you may need one or two more, if you have susceptible cultivars with a history of outbreak...
- MIX mancozeb (M3), captan (M4) or a fixed copper (M1) with
 - a QoI (Pristine, Flint, Abound, FRAC = 11), Rovral (2), Switch (9 + 12), tebuconazole (3) or Howler (NC)
 - Switch + Howler late in the season works too.
 - Copper is not as effective as mancozeb or captan
- In 2022 trial, Mancozeb or Aprovia Top applied at bloom, then Howler or Kendal applied at veraison and on provided good controls.



Sour rot trials



Sour rot trial

Aim: combination of an insecticide plus broad-spectrum fungicide to control fruit flies and sour rot pathogens.

Insecticides: Mustang MAXX (4 fl oz, zeta-cypermethrin, FMC), Entrust SC (2.5 fl oz, spinosad, Dow)

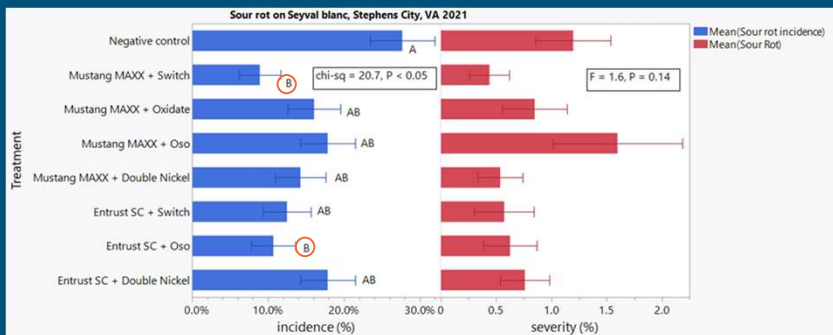
Fungicides: Oxidate (Hydrogen peroxide, BioSafe Systems), Oso 5%SC (polyoxin-D, Certis), Double Nickel (*Bacillus amyloquiesaciens* strain D747, Certis), Theia (3 lb, *B. subtilis*, AgBiome), Howler (7 lb, *Pseudomonas chlororaphis* strain AFS009, AgBiome), Switch (13 oz, Cyprodinil and Fludioxonil, Syngenta), and captan (3 lb/A, Loveland)

- Applied at around 15 Brix and then 7-8 days after the first application, rating at harvest

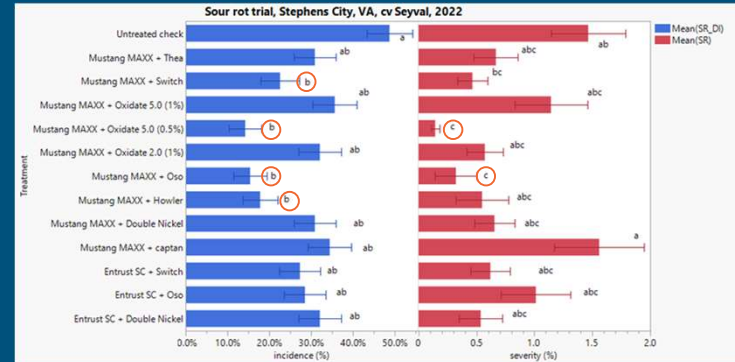
Location: AHS AREC (Winchester), Stephens City, VA, Leesburg, VA

- At Stephens city and Leesburg, treatments were applied in addition to grower's standard spray program. (no data from Leesburg in 2021 and AREC in 2022)

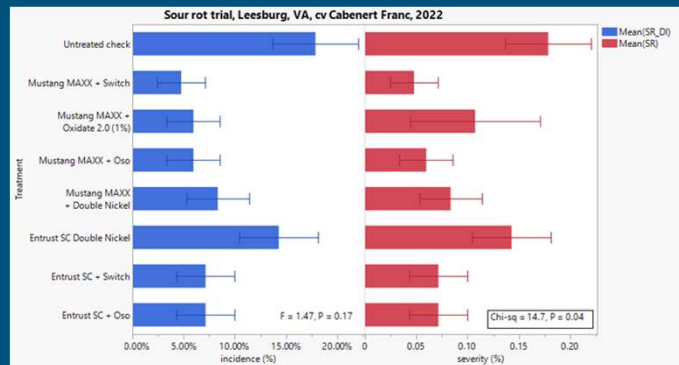
Mustang MAXX + Switch and Entrust SC + Oso resulted in significantly lower sour rot incidence at Stephens City in 2021



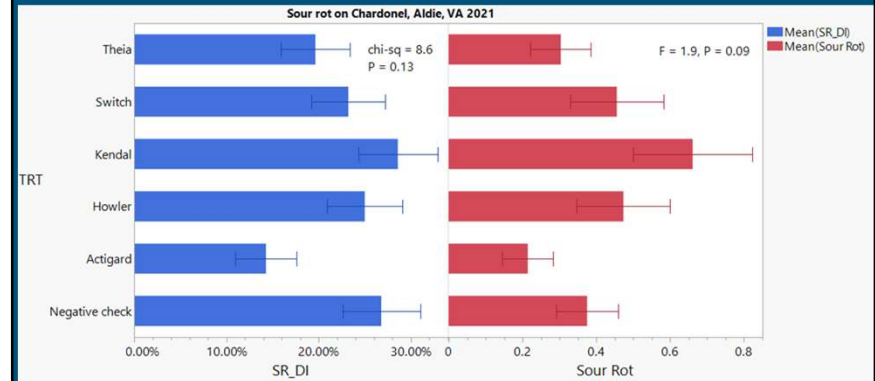
In 2022, Mustang MAXX + Oxidate, MM + Switch, and MM + Oso performed well. MM + Howler was also promising.



At Leesburg location, overall sour rot level was low, and nearly all treatments resulted in numerically lower sour rot.



FYI: Sour rot: none of tested products helped by itself (i.e., we need an insecticide, more on that later)

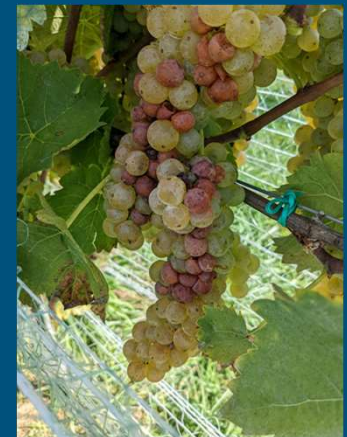


Sour rot trials summary

- Due to the aggregation of sour rot (probably due to distribution of fruit flies), the variation among blocks was very high (i.e., difficult to see statistically significant differences.)
- Mustang MAXX + Oxidate 2.0 or 5.0, MM + Switch, MM + Oso worked consistently well when sour rot pressure was high.
 - Need to have one more year of data for MM + Howler
 - In a previous trial, Oso + Double Nickel performed well
- Entrust SC performed poorly; however, when sour rot pressure was low, nearly all treatments resulted in numerically lower sour rot.
 - Other OMRI-listed insecticides?
- Fruit fly species identified were: *Drosophila melanogaster* (common fruit fly), *D. suzukii* (spotted-wing drosophila (SWD)), and *Zaprionus indianus* (African fig fly)

Sour rot management

- Timing: ~ 15 Brix
- Current recommendation is **TWO** applications of an insecticide (to control fruit flies, e.g., Mustang MAXX) plus a fungicide [Oxidate (NC), Switch (9 + 12), or Oso (19)], 7 to 10 days apart
 - Do not use Mustang Maxx more than twice a season!



Alternative to Mustang MAXX

Spotted-wing Drosophila	Azera	1.0-2.0 p	Spotted-wing drosophila is more important in some varieties than others; growers should incorporate block history. Berries become most vulnerable at about 15 degrees Brix. It is critical to rotate among differing modes of action in order to delay the development of resistance. PyGanic has a short residual life which limits its efficacy. Surround, Entrust and PyGanic are organic alternatives. Be watchful for flare-ups of secondary pests (mealybugs, spider mites) following application of pyrethroids. When available, flowable (F) formulations pose less risk of phytotoxicity than emulsifiable (EC, oil-based) formulations. Avoid using captan and oil-based pesticides within 14 days of each other. For more information on SWD, visit www.virginiafruit.entom.vt.edu/SWD.html .
	Entrust 280	4.0-8.0 fl oz	
	Baythroid XL 1EC	2.4-3.2 fl oz	
	Delegate 25WG	3.0-5.0 oz	
	Malathion 8F	1.88 pt	
	Malathion 5EC	3.0 pt	
	Mustang Maxx	4 fl oz	
	PyGanic 1.4EC	64.0 fl oz	
	Tombstone 25EC	2.4-3.2 fl oz	
	Surround WP	25.0-50.0 lb	
	Sevin XLR Plus	1.0-2.0 qt	

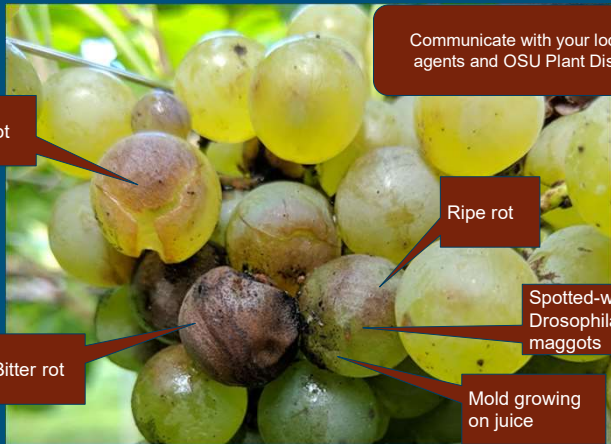
- o Please check the IRAC code!
- o This is VA recommendations. Make sure to check the mid-western guide

Bitter rot

- o Timing: after veraison
- o Materials: captan (M4) or a QoI fungicide (Abound, Flint, Pristine, Intuity, etc., FRAC = 11)
 - o Copper (M1) seems to be not effective



Photo courtesy of Mike Ellis (OSU)
Note the characteristic concentric rings of black fruiting bodies








Communicate with your local extension agents and OSU Plant Disease Clinic.

Acknowledgement

2022-23 Grape Path Team




Our K-9 projects: Detection of Spotted Lanternfly and Grape Powdery Mildew








Evaluating Spotted Lanternfly (*Lycorma delicatula*) detection dog Capability and Limits of detection.

Edgar O. Aviles-Rosa, PhD
Nathaniel J. Hall, PhD
Erica Feuerbacher, PhD
Mizuho Nita, PhD




USDA/ AFRI program





Dogs can detect SLF eggs with high sensitivity and specificity.

Study 1: Conclusions




- ✓ Dogs can readily detect SLF eggs
 - ✓ Sensitivity and specificity > 95 %
- ✓ Relevant distractors

2022 update

- We will be working with "Nosework" group to have a training session(s) in VA.
- <https://www.nacsw.net/>
- The schedule will be posted on my blog



Questions?



Funding sources



Virginia Wine Board



USDA SCRI-Block Grant