

## Grape Pathology Program Updates: Fungicide Field Trials with “alternatives”: grape late season rots and protective materials

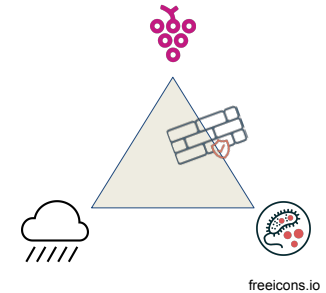
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Virginia Tech

For Virginia Vineyard Association Winter Technical Meeting  
16 Feb 2023

Slides will be uploaded to: <http://ext.grapepathology.org>

## Biologicals 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.



## 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)

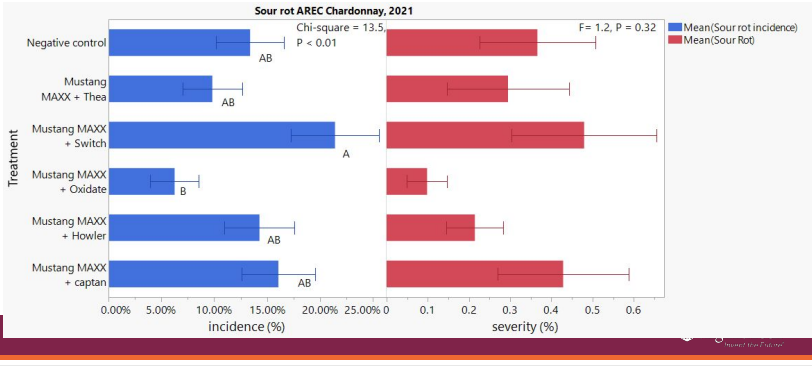
**Fungicides:** **Oxidate** (Hydrogen peroxide, BioSafe Systems), **Oso 5%SC** (polyoxin-D, Certis), **Double Nickel** (*Bacillus amyoliquesaciens* strain D747, Certis), **Theia** (3 lb, *B. subtilis*, AgBiome), **Howler** (7 lb, *Pseudomonas chlororaphis* strain AFS009, AgBiome), **Switch** (13 oz, 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

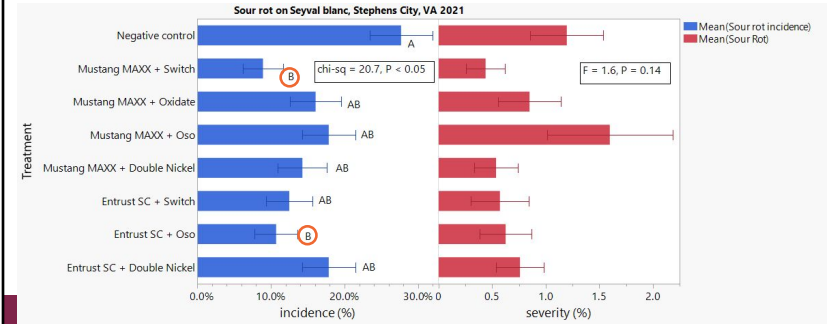
Location: AHS AREC (Winchester), Stephens City, VA, Leesburg, VA

- 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)

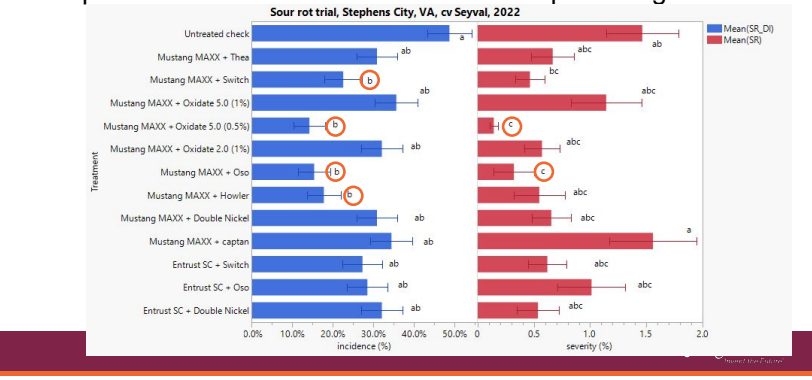
### None of treatments resulted in significantly lower sour rot at AHS AREC trial



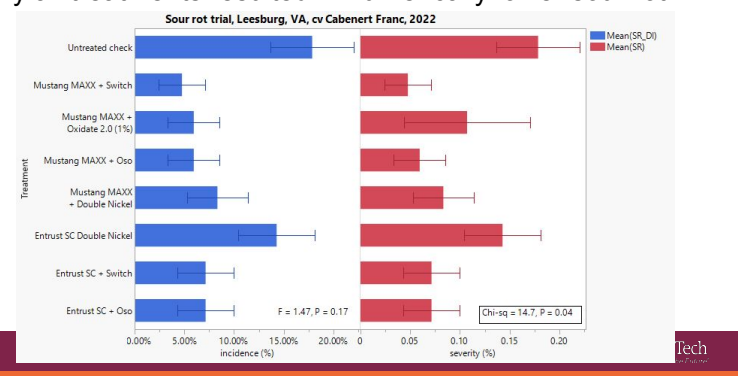
### Mustang MAXX + Switch and Entrust SC + Oso resulted in significantly lower sour rot incidence at Stephens City



### 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.



## Sour rot trials summary

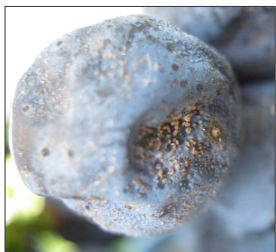
- Mustang MAXX + Oxidate 2.0 or 5.0, MM + Switch, MM + Oso worked consistently well when sour rot pressure was high.
  - Need to have one more year of data for MM + Howler
  - In a previous trial, Oso + Double Nickel performed well
- Entrust SC performed poorly; however, when sour rot pressure was low,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

## 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 <a href="http://www.virginiafruit.ento.vt.edu/SWD.html">www.virginiafruit.ento.vt.edu/SWD.html</a> .
	Entrust 2SC ?	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	

Please check the IRAC code!

## Ripe rot trials



## 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 mycooides* isolate J, Certis) (and **Kendal**)(**Vacciplant** was also tested, but did not work well against ripe rot)

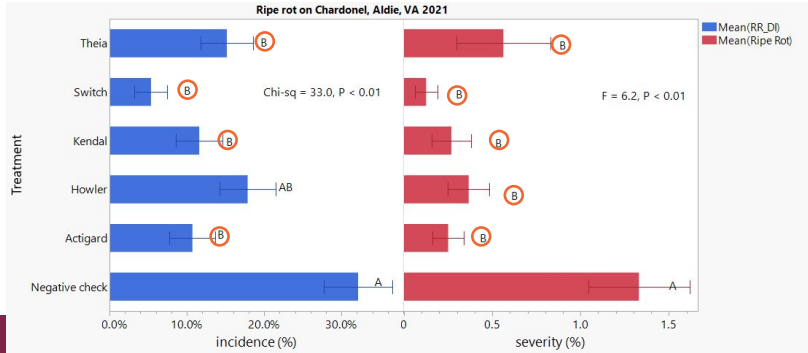
**Fungicide:** **Switch** (13 oz, Syngenta)

- 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 wks after veraison

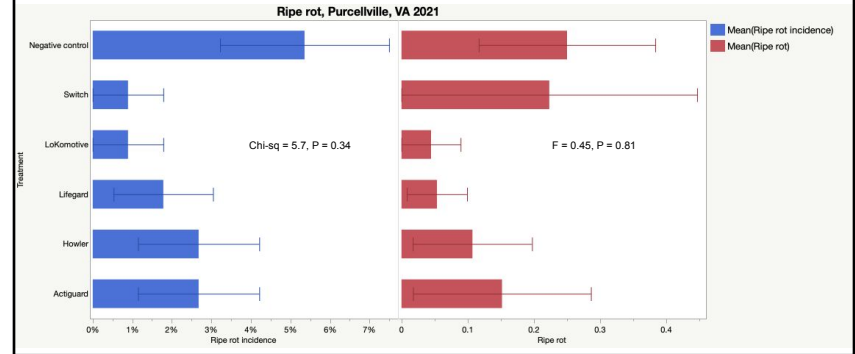
Location: AHS AREC (Winchester), Purcellville, VA, and Aldie, VA

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

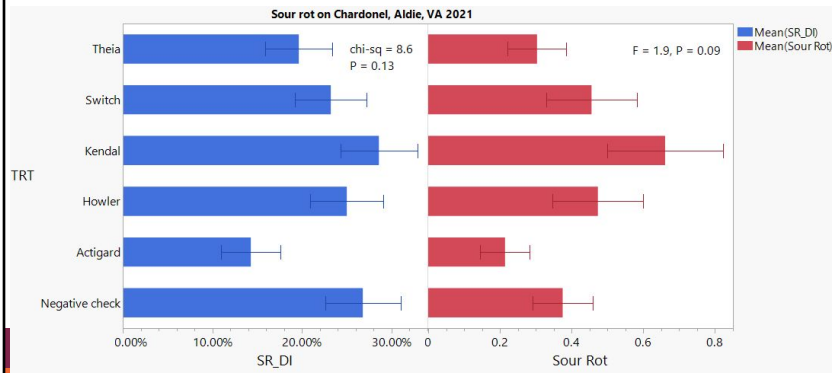
Nearly all treatments resulted in significantly lower ripe rot incidence and severity at Aldie in 2021



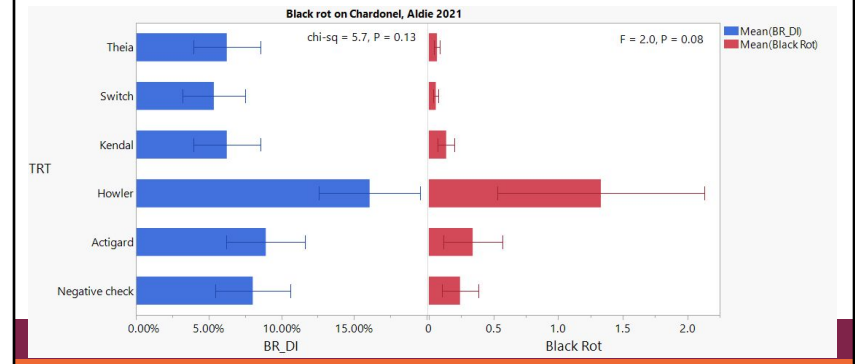
Very low ripe rot at Purcellville, VA (no significant treatment effect), but all treatments were numerically lower in incidence.



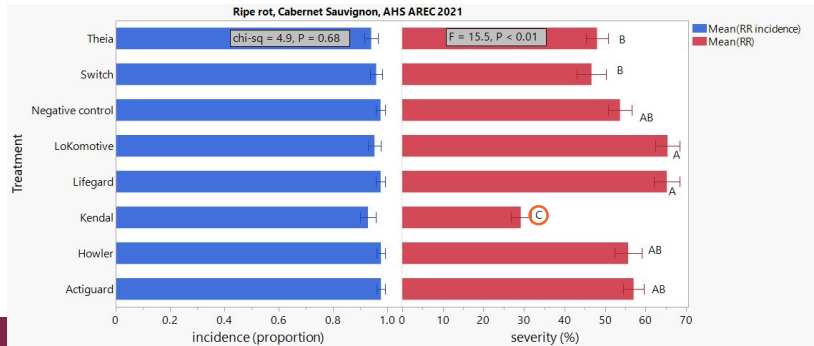
FYI: Sour rot: none of tested products helped by itself (i.e., we need an insecticide)



FYI: Black rot... none of the tested products helped



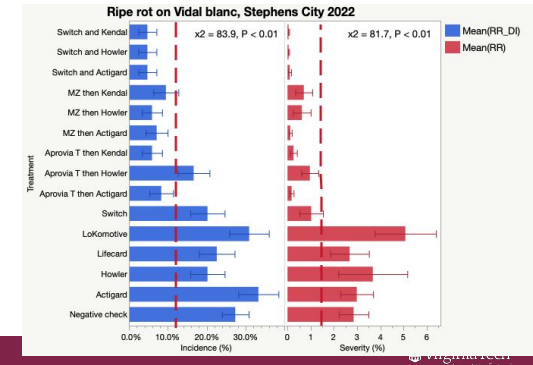
## Ripe rot outbreak at AHS AREC plot in 2021 and 22



## 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



## Summary

### Sour rot

- Some combinations (Mustang Maxx + Switch, MM + Oxidate, MM + Oso, Entrust SC + Oso) significantly reduced sour rot, but variations among clusters and blocks were high.
- Entrust SC treatments worked less.

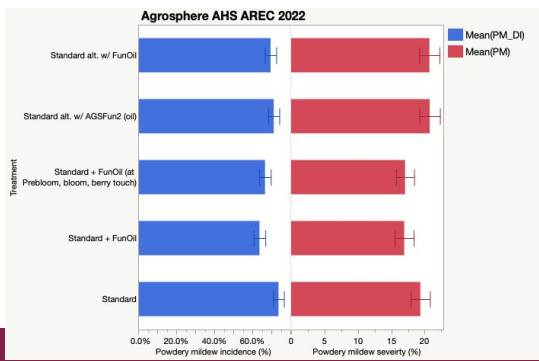
### Ripe rot

- 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 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.
- None of treatments worked consistently; however, a combination of Mancozeb, Switch or Aprovia plus another looked promising.

Mr. Manoj Subedi joined our lab in January 2022 to pursue his MS degree.



### Agrosphere Oil powdery mildew trial (Standard = sulfur): Alternating with an Oil product did not significantly differ from the standard (but...)



### Protective shelter trial

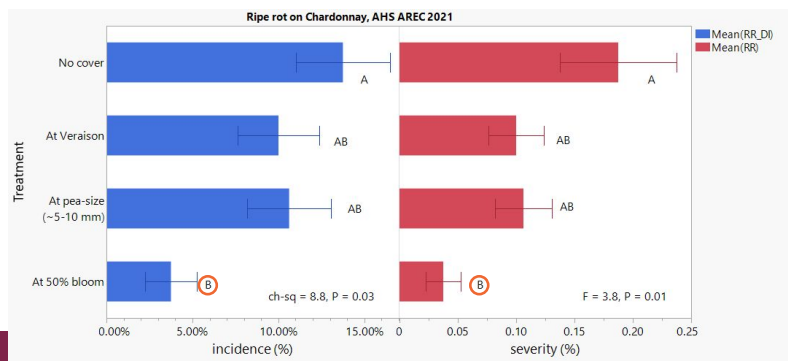
Aim: determine the effect of timing of shelter application

- 18-in long 4 Mil plastic sheet to protect the fruiting zone
  - We have a good success with a photo-degradable mulch in 2021-22
- This shelter does not have any support other than lateral shoots (intentional)

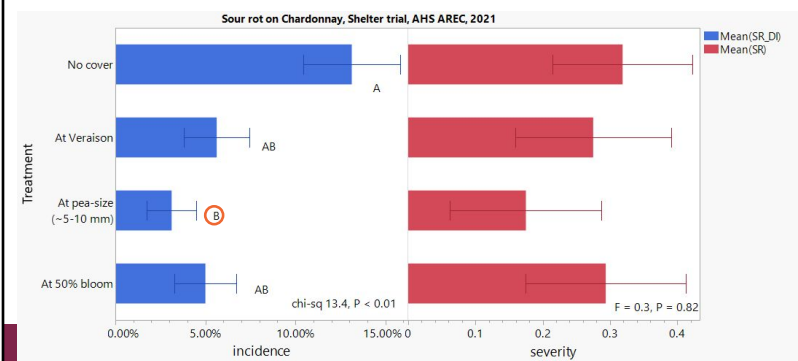
Timing: at 50% bloom, pea-size (~5-10 mm berry size), veraison (color change), and no cover



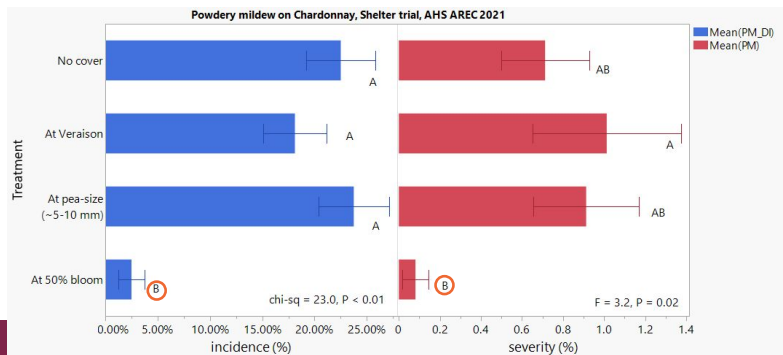
### Shelter timing, effect on ripe rot, earlier the better



### Sour rot incidence was reduced regardless of application timing.



## Powdery mildew, early application worked the best



## Summary

### Shelter

- Earlier application of the protective shelter is the key for black rot and ripe rot management.
  - You have to control powdery mildew and black rot before the shelter application (which may dictate the timing decision).
- Photo-degradable mulch and fruit bags have been tested and both worked well.

Mr. Mahadi Redoy joined our lab in January 2022 to pursue his MS degree.



## My take on alternative materials (biologicals and plant defense activators) at this point, under our conditions

- Compared with conventional options, the efficacy is lower and less consistent; however, it will help us to spray less and prolong shelf life of conventional materials.
- As with any other fungicides, we need to know the target pathogen(s) that the material can control.
  - Labels tend to include many pathogens, but it may not be relevant in grapes.
- The use case scenarios will be tank-mix, rotation partner, and spray to fill the "gap" of applications.
  - The other potential use, especially once we know the target pathogen is to apply BEFORE the onset of a particular pathogen to help conventional materials.
  - Use of these materials with disease-resistant cultivars

## Acknowledgement

2022-23 Grape Path Team

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