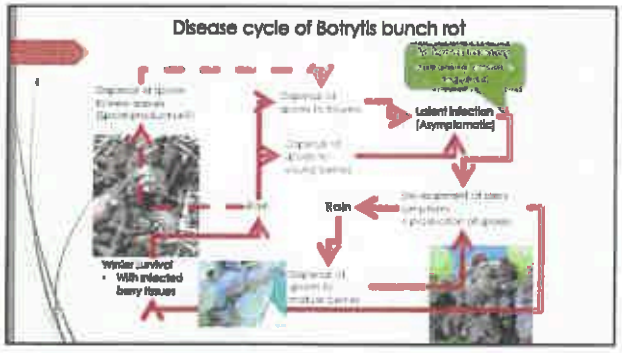
Diagnosis and Management of Late Season Fruit Rots

Botrytis Bunch Rot

Disease cycle of Botrytis bunch rot



Botrytis Management

Bottom line for Botrytis management
Timing of fungicide application

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

Botrytis Management
Preventative fungicide options

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

Probability of resistance development

Very high risk

- Flint (and other Gen. 11)

High Risk

- [illegible]

Moderate

- [illegible]

Unknown

- [illegible]

Level of resistance if you find them

High

- Flint

Moderate to high

- [illegible]

Moderate

- [illegible]

Low

- [illegible]

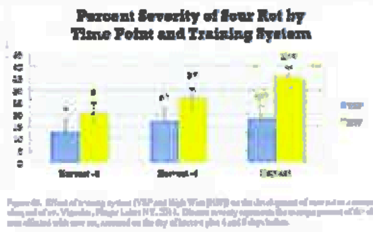
Sour rot

Photo courtesy of Megan Hall

Sour rot management

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- Unless otherwise noted, all information provided in "sour rot" section is from research efforts done by Drs. Wayne Wilcox (Cornell) and Megan Hall (U. Missouri)

Provide open canopy



Use of "fungicide" and an insecticide

Here's a tentative recommendationagainst sour rot (subject to be changed)

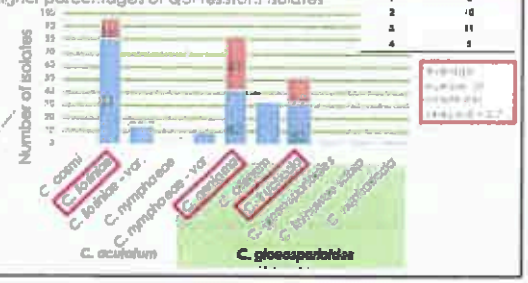
Ripe Rot of grape

- Indirect damage

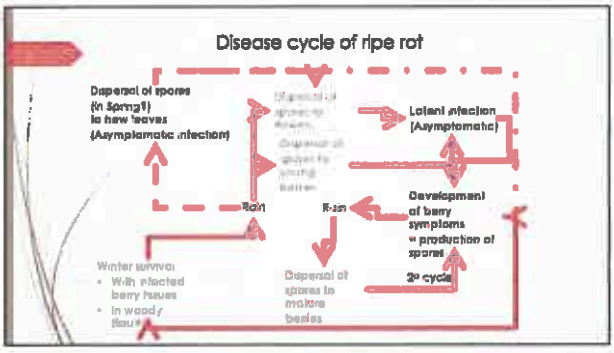
Pathogen ID (Charlotte Oliver)

- *C. aenigma, C. allenum, C. fructicola, C. fioriniae, & C. nymphaeae*

25% of our isolates were resistant to QoI (Abound) and more prevalent species had higher percentages of QoI resistant isolates

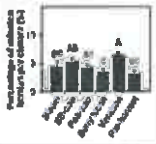


Disease cycle of ripe rot



Ripe rot trials 2015-17

- [illegible] Winchester, VA (ARS), Abingdon VA (Southwest), VA
- [illegible]
- [illegible]



Newer fungicides tested in ripe rot trials
SDHIs

Aprovia (Syngenta)
- SDHI (FRAC = 7)
- A.I. = benzovindiflupyr
- [illegible]
- [illegible]

Miravis (Syngenta)
- SDHI (FRAC = 7)
- A.I. = Pydiflumetofen
- [illegible]

Newer fungicides tested in ripe rot trials DMI and Polyoxin-D

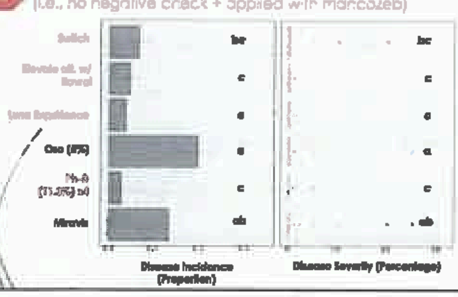
Oso (Certis)

Ph-D Fungicide

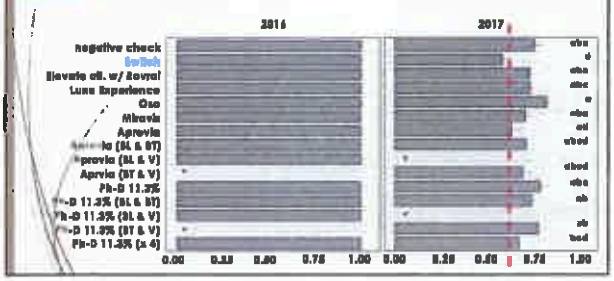
AHS AREC Spray Program

2015	cyprodinil + fludioxonil	Switch® 62.5 WG	9, 12	BL, BT, V
	fenhexamid alt. w/ iprodione	Elevate® 50 WDG & Rovral®	17, 2	BL, BT, V
	fluopyram + tebuconazole	Luna® Experience	7, 3	BL, BT, V
	polyoxin-D	Oso™ 5%SC	19	BL, BT, V
	polyoxin-D	Ph-D®	19	BL, BT, V, LM
	pydiflumetofen	Miravis®	7	BL, BT, V
Added	benzovindiflupyr	Aprovia®	7	BL, BT, V
2016	benzovindiflupyr	Aprovia®	7	BL, BT
& 2017	benzovindiflupyr	Aprovia®	7	BL, V
	benzovindiflupyr	Aprovia®	7	BT, V
	polyoxin-D	Ph-D®	19	BL, BT, V,
	polyoxin-D	Ph-D®	19	BL, BT
	polyoxin-D	Ph-D®	19	BL, V
	polyoxin-D	Ph-D®	19	BT, V

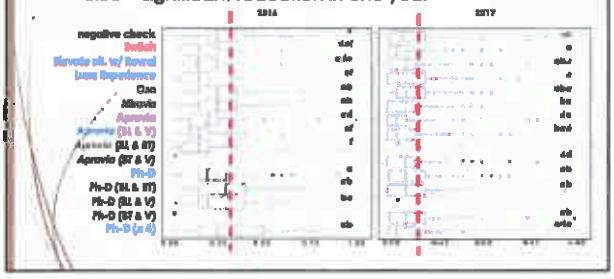
AHS AREC 2015 Ripe rot data from Botrytis trial (i.e., no negative check + applied with mancozeb)



AHS AREC: Cluster disease incidence (Yes/No per cluster)
Single product trial: negative check = Revus and Vivando



AHS AREC – Cluster disease Severity (% area infected)
Red = significant reduction in both years
Blue = significant reduction in one year



AHS field trial summary

Field Trials

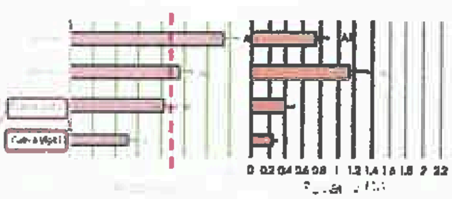
1.
2.

- A general[illegible] mixed model (GLIMMIX, SAS 9.4) was used for ANOVA [illegible]

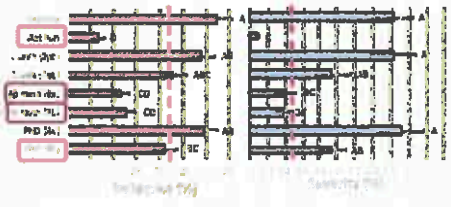
Southwestern VA spray program

[illegible] Treatment (rate/A, 100 gal)	Timing	[illegible] Treatment (rate/A, 100 gal)	Timing
Control		Control	
[illegible] (2pt)	BL, ST, V, LM	Viathon (2pt)	BL, ST, V
Cueva (2 pt)	BL, ST, V, LM	Cueva (2 pt)	BL, ST, V
Cueva (4 pt)	BL, ST, V, LM	Cueva (4 pt)	BL, ST, V
		Aprovia (9.8 oz)	BL, ST, V
		Aprovia (9.8 oz)	BL
		[illegible] (6.2 oz)	BL, ST, V
		PHD (6.2 oz)	BL

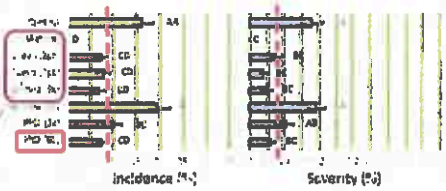
Southwestern VA, 2015



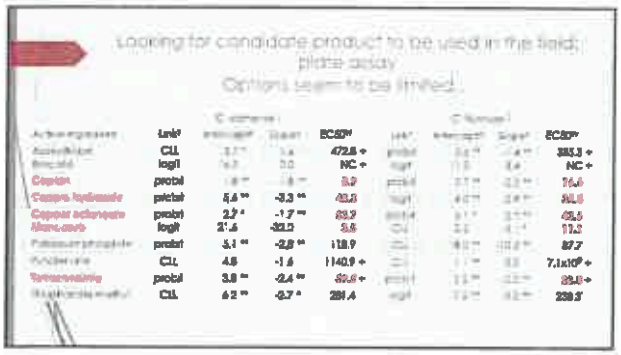
Southwestern VA, 2016

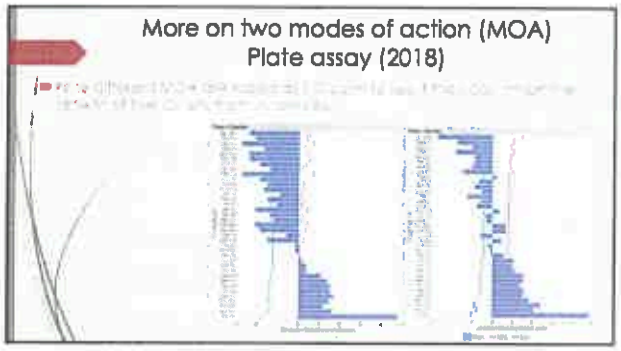


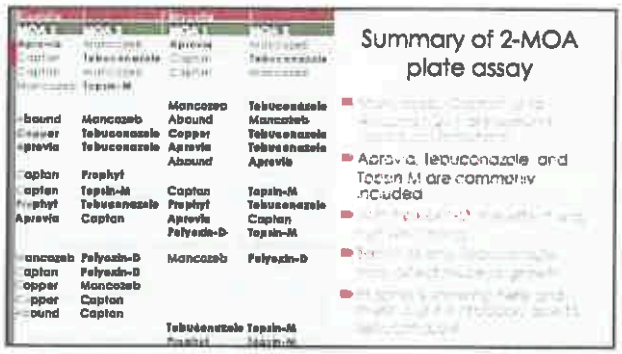
Southwestern VA, 2017



Single mode of action is probably not enough to stop ripe rot...


Looking for candidate product to be used in the field: plate assay
Options seem to be limited


More on two modes of action (MOA)
Plate assay (2018)


Summary of 2-MOA plate assay
Aprovia, Tebuconazole and Topsin M are commonly included

Not all DMI fungicides are equally effective against *Colletotrichum* species...

- [illegible]
- [illegible]
- [illegible]

Summary

- [illegible]
  - [illegible]
  - [illegible]
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  - [illegible]
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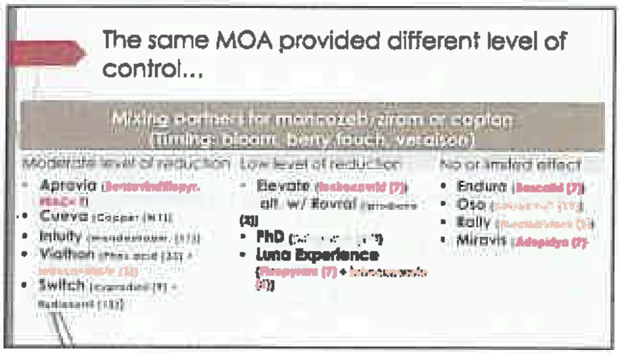
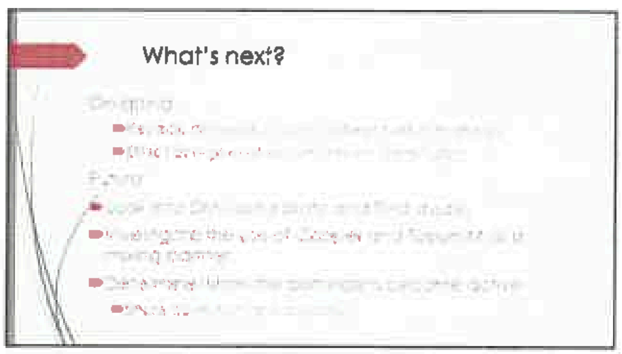
- [illegible]
  - [illegible]
  - [illegible]
- [illegible]
  - [illegible]

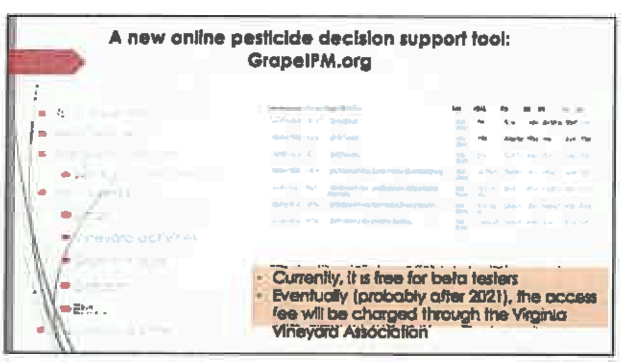
Mixing multiple MOA is probably the key for ripe rot management

Mixing partners for [illegible]

Moderate level of reduction	Low level of reduction	No or limited effect
• **Aprovia** (Benzovindiflupyr, FRAC= 7) • **Cueva** (Copper (M1)) • **Intuity** (mandestrobin, (11)) • **Viathon** (Phos acid (33) + tebuconazole (3)) • **Switch** (cyprodinil (9) + fludioxonil (12))	• **Elevate** (fenhexamid (7)) alt. w/ **Revral** (Iprodione (2)) • **PhD** (polyoxin-D (19)) • **Luna Experience** (Fluopyram (7) + tebuconazole (3))	• **Endura** (Boscalid (7)) • **Oso** (polyoxin-D (19)) • **Rally** (myclobutanil (3)) • **Miravis** (Adepidyn (7))


The same MOA provided different level of control…
Mixing partners for mancozeb/ziram or captan
(timing: bloom, berry touch, veraison)
Moderate level of reduction
Apravia
Cueva (Copper (M1))
Intuity
Viathon
Switch
Low level of reduction
Elevate
alt. w/ Rovral
PhD
Luna Experience
No or limited effect
Endura (boscalid (7))
Oso
Rally
Miravis (Adepidyn (7))


What's next?


A new online pesticide decision support tool:
GrapeIPM.org
Etc…
Currently, it is free for beta testers
Eventually (probably after 2021), the access fee will be charged through the Virginia Vineyard Association

GrapeIPM.org current functions

GrapeIPM.org current functions

GrapeIPM.org current functions

Acknowledgements

- USDA, NIFA BIP Grant [2014-]