Development of IPM Strategies to Improve Management of Spotted Wing Drosophila and Sour Rot in Grapes

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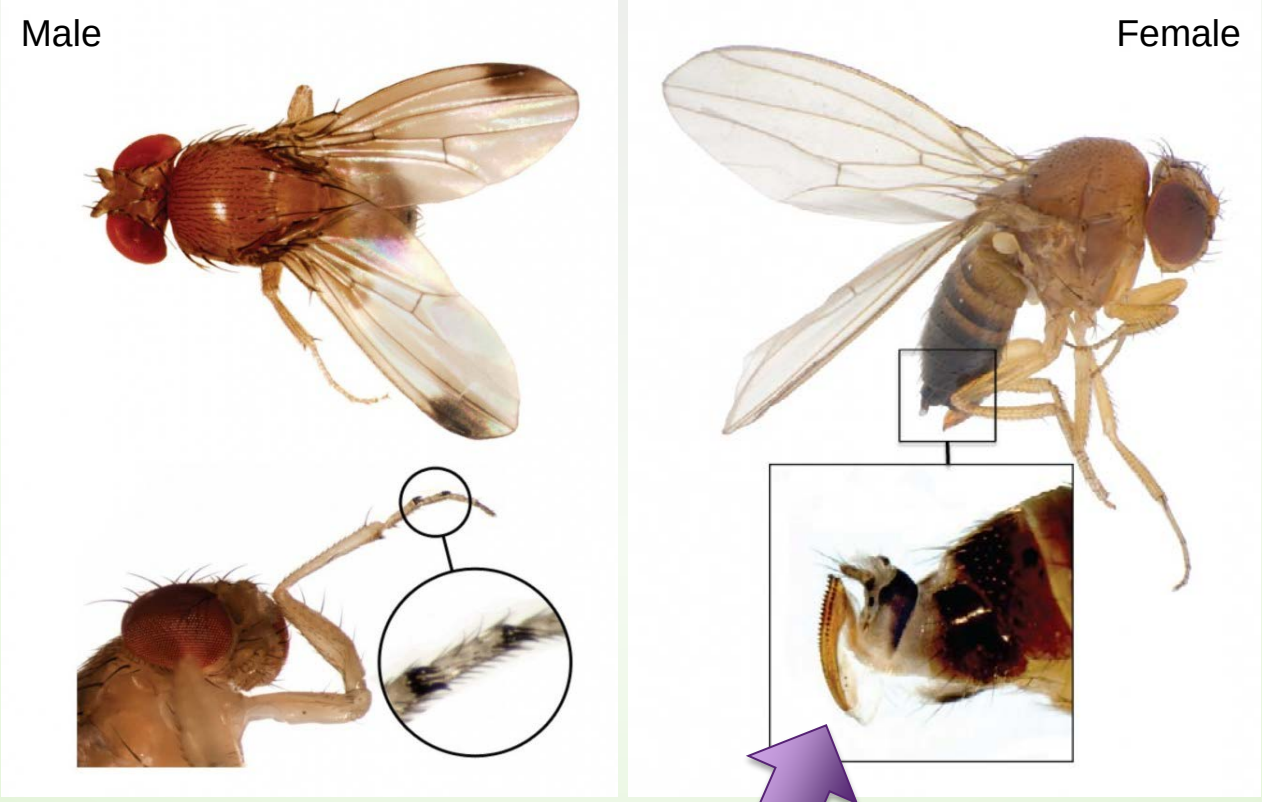
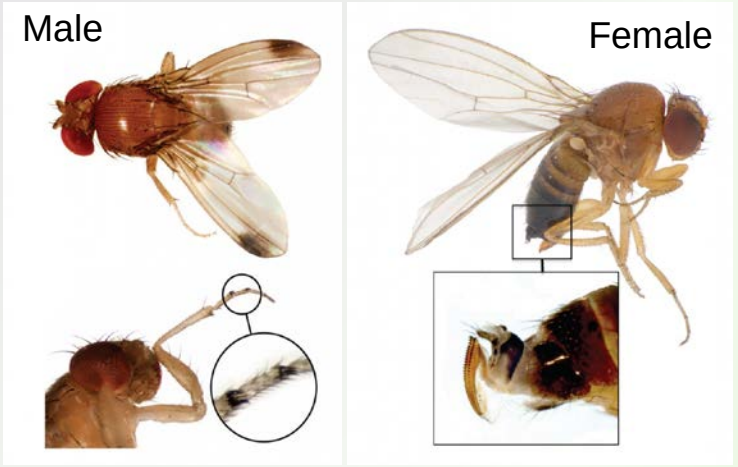
Spotted wing drosophila

- Vinegar (fruit) fly
- 0.07-0.13 in long with red eyes
  - **Males** have black spot wings
  - **Females** have a saw-like, ovipositor



Spotted wing drosophila

- Lay eggs in ripening fruit
  - Larvae feed and pupate within fruit
  - Full life cycle as quick as 8-10 days
- Grapes become attractive a 15^{o}Brix
- Larvae may infest fruit at harvest
- **Potential to exacerbate and spread microbes → rot**

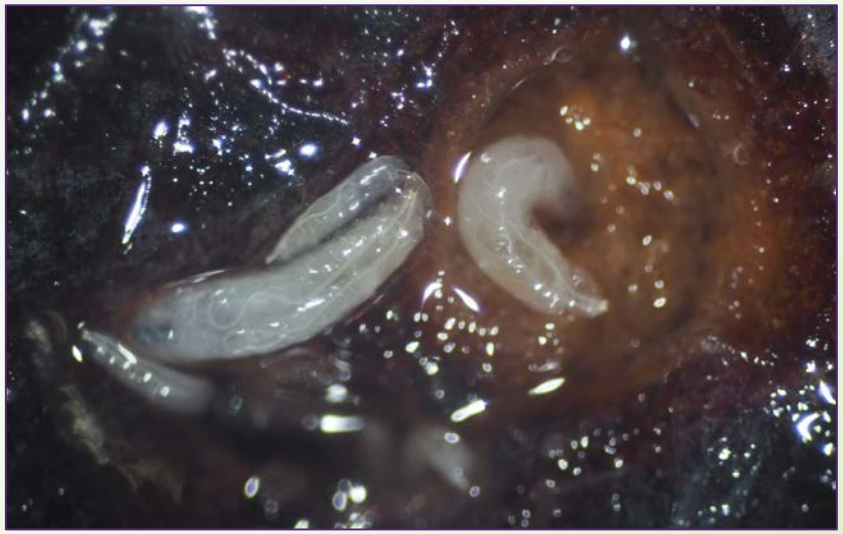


Monitoring for SWD

- SWD is attracted to many volatiles
  - Including vinegar, wine, yeast, and fruit
- Bait for traps
  - 1 tbsp dry yeast, 4 tbsp white sugar, and 2 cups of water + unscented dish soap
  - Solution should be 1–2 inches in trap
  - Traps can be made from plastic containers with 6 to 12, 3/16-inch-diameter holes about 2/3 around
- Commercial lures and traps are available
- Deploy traps at verasion
- Place traps on the north side of rows at fruit level

Checking fruit for larvae

- Larvae may be present in fruit before adults are caught in traps
  - Also indicates whether sprays are effective
- Collect intact, ripening grapes
  - Place fruit in a flat, dark pan or zip-lock bag
  - Add a salt solution (**1⁄4 cup salt to 4 cups water**)
  - Wait ~15 minutes for larvae to exit the fruit
  - Larvae found in recently ripened fruit are likely to be SWD



Effective spotted wing drosophila management options

Trade Name	Active Ingredient; IRAC	Rate/acre	Efficacy
Malathion 8F	malathion; 1B	1.88 pt	++++
Imidan 70W	Phosmet; 1B	1.33-2.12 lb	+++
Mustang Maxx	zeta-cypermethrin; 3	2-4 oz	++++
Danitol 2.4 EC	fenpropathrin; 3	10.66 fl oz	+++
Delegate	spinetoram; 5	3-5 oz	+++
Entrust 80W (organic)	spinosad; 5	1.25-2.5 oz	+++

Sour rot

- Pre-harvest cluster decay
  - Smells like vinegar
  - Due to a complex of *fungi*, *bacteria*, and *yeast*
  - Most susceptible after veraison
- Berry injury encourages infection
  - Hail or mechanical damage
  - Growth cracks
  - Birds
  - Other fungal infections
  - **Insects!**
- Chemical management is limited
- Management is based on reducing fruit injury

Botrytis bunch rot

- Gray mold*, Botrytis cinerea*
- Attacks dead, injured, or senescent tissues
- Berry injury can exacerbate infection
- The fungus thrives in high humidity
- Berries are most susceptible to infection after veraison
  - Berries turn brown or reddish
  - Fungal growth produces gray, velvety mycelium and spores

Concept

- Previous research from Cornell*
  - Oxidate 2.0 + Mustang Maxx → decreased berry rot at harvest
- Combine pesticide treatments with with leaf pulling
  - Exposed clusters increase sunlight and airflow
  - Decreases the suitability of the vines for SWD and sour rot
  - Improved spray coverage

*Hall et al. 2018, American Journal of Enology and Viticulture

Objective

Evaluate the combination of **fruit-zone leaf removal**, **fruit fly control,** and **microbial management** on the reduction and incidence of sour rot.

Methods

No leaf removal		Leaf removal	
Pesticide	No pesticide	Pesticide	No pesticide

- Two Chardonnay vineyards with VSP training systems
- Treatments were arranged in a strip-plot design, replicated six times
- Leaf removal was initiated post-fruit set on June 12,
  - Six basal-shoot leaves were removed from each of the leaf removal plots
- Pesticide treatments were applied on a 10 day cycle starting at 10^{o}brix

Pesticide treatment

- Applied to only the “Pesticide” vines
- 10 day cycle

Application	Trade Name	Rate/acre
1	Mustang Maxx	4 oz
	Oxidate 2.0	64 fl oz
	Pristine	12.5 oz
2	Malathion 8F	1.88 pt
	Oxidate 2.0	64 fl oz
	Pristine	12.5 oz
3	Delegate	5 oz
	Oxidate 2.0	64 fl oz
	Pristine	12.5 oz

Cover sprays

- Applied to all vines in the project
- Same 10 day cycle
- Targeting downy mildew, powdery mildew, and rots

Application	Trade Name	Rate/acre
1	Elevate	16 oz
	Rally	5 oz
	Zampro	14 oz
2	Elevate	16 oz
	Rally	5 oz
	Revus	8 oz

June 12, 2018

July 21, 2018

August 21, 2018

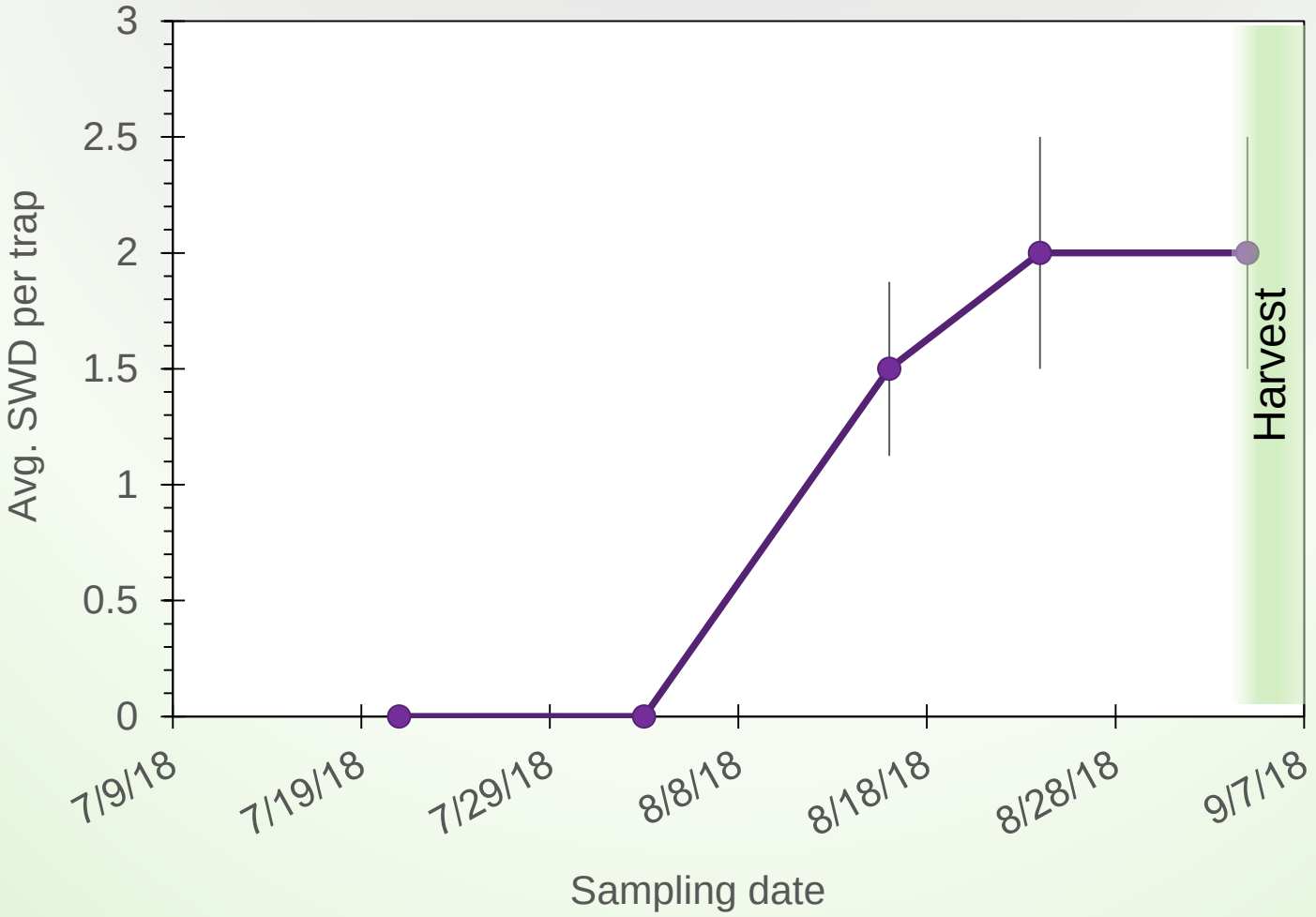
Assessed rot prior to harvest

Sour rot

Botrytis

- 26 grape clusters per sub plot were evaluated for sour rot and Botrytis incidence and severity at each site
  - 156 clusters per treatment combination

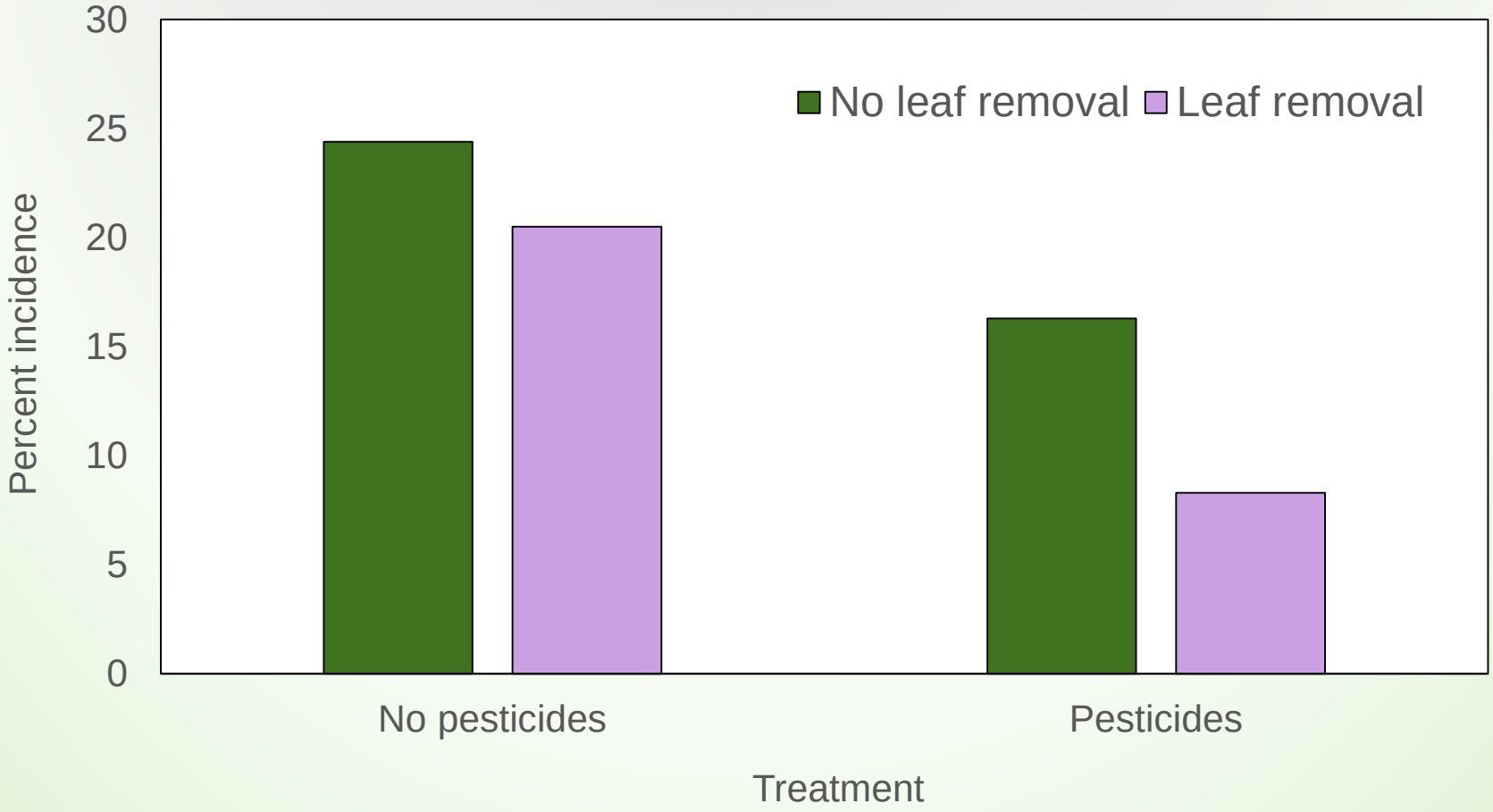
SWD field abundance



SWD berry infestation

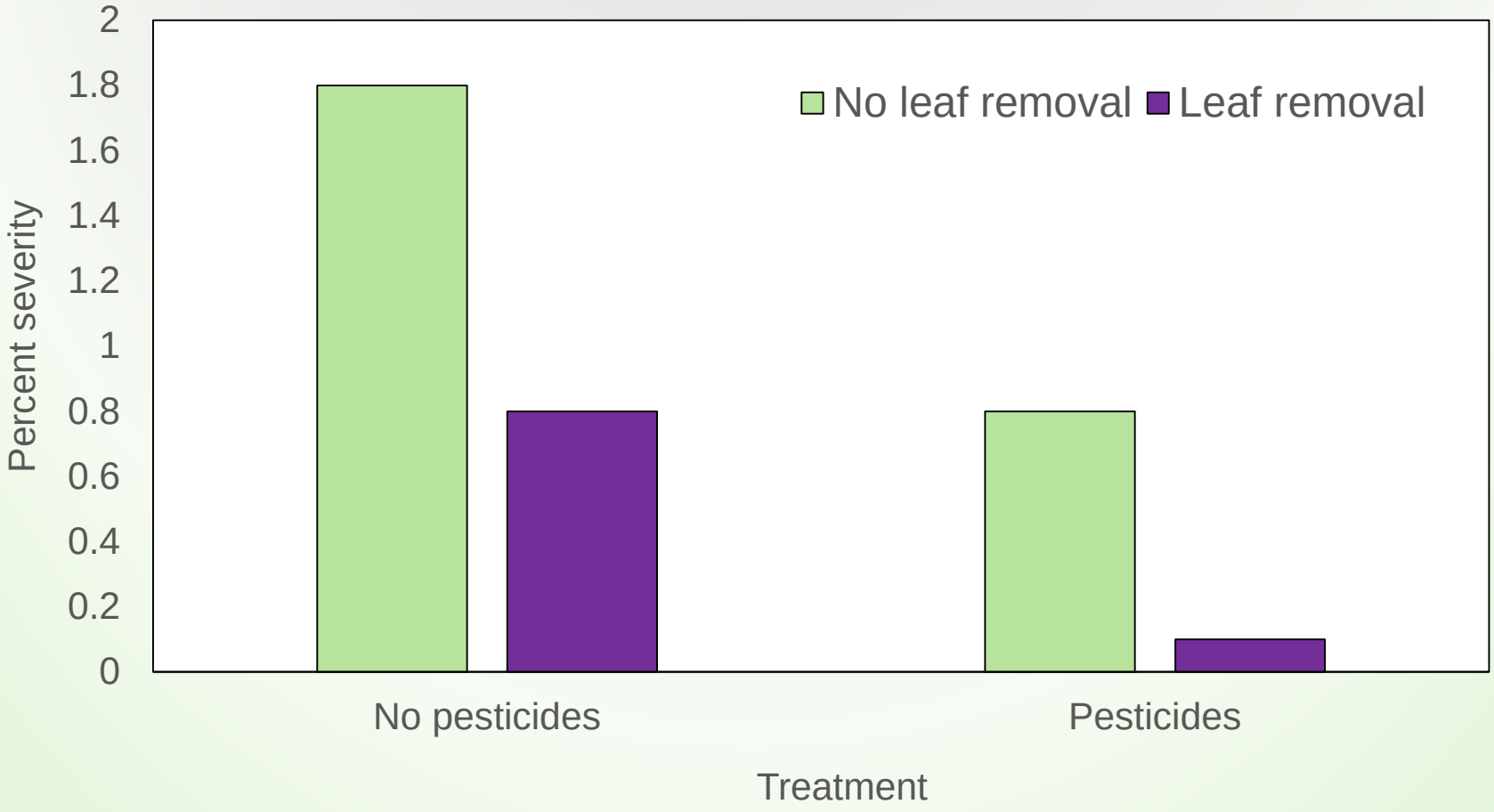
- Out of 48 clusters, only a single fruit fly larva was found
- Collected from a pesticide with no leaf removal treatment vine

Sour rot + Botrytis *incidence*



Note: only one site had measureable levels of sour rot and Botrytis

Sour rot + Botrytis *severity*



Note: only one site had measureable levels of sour rot and Botrytis

Summary

- Overall levels of sour rot and Botrytis in the Chardonnay were low
- Pesticide application significantly reduced rot incidence
  - Disease severity was also numerically lower
- Leaf removal decreased disease pressure
- No significant interaction between pesticides and the leaf pulling
  - Trend towards an additive impact for decreasing sour rot and Botrytis

★ The combination of leaf pulling and pesticides provided the lowest disease pressure

★ Encouraging first step in developing management guidelines to effectively management sour rot

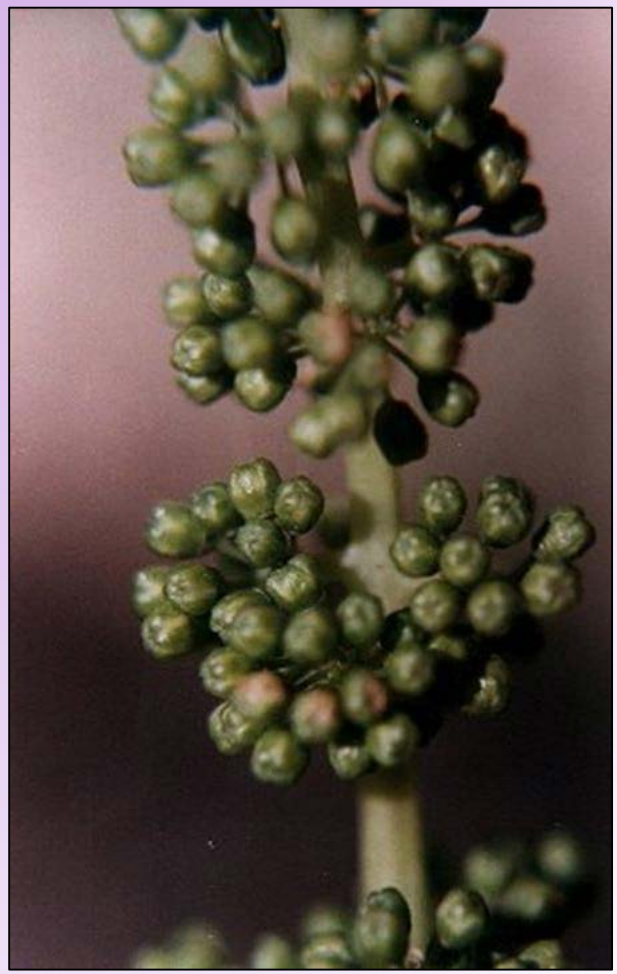

Questions?

Thrips

- Small, 0.04 inch long, with distinctive feathery wing
- Two important species
  - **Western flower thrips** populations peak in spring
    - Coinciding with grape bloom
  - **Grape thrips** populations peak in early summer
    - Coincides with peak vine growth
    - As growth slows, the numbers of thrips decreases
- Damage includes:
  - Stunted shoots and leaf stippling/necrosis
  - Halo-spotting on the fruit due to egg laying
  - Scarring of berries with their feeding
- **Generally not a problem in wine grapes**

Potential thrips issues in Blanc du Bois

- Primarily West Georgia growers
- Other varieties?
  - Maybe Norton?
- Browning and dying of the blooms
  - **Cladosporium** and **yeast** are associated with the damage
  - **Pathogens are likely secondary** to thrips feeding



Management tips

- Thrips are attracted to flowers
  - Such as flowering weeds within vineyard
  - eg. Dandelions, morning glory, wood sorrel, and clover

- Weeds can provide resources for thrips
  - Build up populations on the weeds
  - Then move up into the grape flowers/berries

- Good **weed control is essential**
  - Particularly pre- grape bloom
  - Note, managing weeds during bloom may be too late

Chemical management

Trade Name	Active Ingredient; IRAC	Rate/acre	Efficacy
Aza-direct	azadirachtin ; UN	1-2 pt	++
PyGanic 1.4EC	pyrethrins; 3A	16-64 fl oz	++
Danitol 2.4 EC	fenpropathrin; 3A	10.33–21.22 fl oz	++
Venom	dinotefuran; 4A	1-3 oz	+++
Assail 30SG	acetamiprid; 4A	2.5 - 5.3 oz	++
Delegate	spinetoram; 5	3-5 oz	+++
Entrust 80W (organic)	spinosad; 5	1.25-2.5 oz	+++

***Most effective just prior to bloom**

Thanks!

- UGA Fruit Entomology Lab
- Grower cooperators
- Funding
  - HATCH
  - Small Fruits Consortium


Questions?