Spotted Wing Drosophila on berry crops



November 2017

Spotted wing Drosophila

- Drosophila suzukii
- The new species attacks <u>healthy</u> ripening fruit



• Looks like common vinegar flies on overripe, fallen, decaying fruit



The Ohio State University

Origin

- From Asia
- In Hawaii since 1980
- 2008: California
- 2009: Florida, Washington, Oregon
- 2010: Michigan, Carolinas, Utah
- 2011: Ohio (Van Wert County)

Hosts



- Early: cherries
- Mid: raspberries, blueberries, blackberries
- Late: grapes
- strawberry, peach, plum
- cherry tomato, kiwi, pear, apple



Fruit injury by Spotted wing Drosophila











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• Say "Larvae"!
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• Do not say "Maggots"!



Monitoring spotted wing Drosophila

- Critical: is this pest present on farm?
- Use bait traps to monitor adult flies
- Use salt test to monitor larvae in fruit

Baits to trap adult flies?

• Attractants

- -Fermenting matter
- -Apple cider vinegar
- -Wine vinegar
- -Yeast dough
- Differences?
 - -Earliest catch?
 - -Fewest non-targets?





i.d. of adult male Spots on wings Spots can be absent on young (newly emerged) males 2 dark bands of combs on front leg



SWD Workshops, 2013 - 2017 Image: Constraint of the second seco

SWD trap network, 2017

• 40 sites in 19 Ohio counties

• trap counts on website

- 1 4 traps per site
- u.osu.edu/pestmanagement





Seasonal trends in SWD traps

- 1st catch mid-July at most sites
- 1st catch June at few sites
- Higher catch when cool & wet
- Lower catch when hot & dry
- Peak catch in Sept.- October

Trap Deployment Basic Rules

- Minimum: 2 traps per crop
 - 1 in interior
 - 1 at field edge
 - Reduce to 1 trap after 1st detect
- Place in crop canopy 1-2 weeks prior to fruit ripening, near fruit clusters

 Holes facing outward
- Recommendation by supplier:
 - 5-6 traps per 10 A of berries
 - 3-4 traps per 40 A of tree fruit

Test fruit for SWD larvae with salt test



- Put fruit in bag or jar
- Add warm water + salt
- Examine top surface in 15 minutes
- Larvae will float



Salt	Warm water
1 Tablespoon	1 cup
¼ cup	1 quart (4 cups)
1 cup	1 gallon

Salt test results: fruit lots inspected for SWD larvae at Holmes County produce auction, 2014

Fruit	Auction lots SWD positive	Auction lots SWD negative	% Positive
mulberry	0	2	0
elderberry	0	8	0
plums	0	1	0
garden huckleberry	0	1	0
ground cherry	0	1	0
grapes	3	32	9
blackberry	3	8	27
red raspberry	12	14	46
Teu Taspberry	12	14	40

Managingspotted wing DrosophilaScenarioAction neededSWD not yet
found on farmUse bait trap for adult fly,
weekly, all season or until first
detection of adultSWD was found
on farm lastUse bait trap for adult fly, until
first catch of the new year to

on farm <u>last</u> year	first catch of the new year, to determine when spray schedule should start
SWD was found on farm <u>this</u> year	Use salt test weekly to see if control program effective

Insecticide strategy for SWD control

- Decisions
 - -When to start spraying?
 - -What product(s) to spray?
 - -How often to spray?
- Factors
 - -How often crop is harvested
 - -Pre-harvest interval
 - -How long residue is active

When to start spraying insecticide for SWD?

- If the adult flies are detected
- Fruit is susceptible to injury once it has started to turn color







Insecticide choices for SWD control				
Efficacy	Group	Product		
Most	spinosyns	Delegate, Radiant		
effective	diamides	Exirel		
	organo- phosphates	Imidan, Diazinon		
	pyrethroids	Mustang Max, Brigade, Pounce, Hero, Danitol, Baythroid, Asana, Warrior		
	carbamates	Lannate		
Effective	organo- phosphates	Malathion		
	carbamates	Sevin		
	spinosyns	Entrust [OMRI]		
Moderately	neonicotinoid	Assail, Actara, Provado		
Slightly	pyrethrins	Grandevo, Pyganic, [OMRI]		

llaw offers	Product	Residual activity
How often	Exirel	5 days
to spray?	Delegate	5-7 days
	Imidan, Diazinon	7 days
When residues no longer active	Pyrethroids: Asana Brigade Danitol Hero Mustang Max Warrior	7-10 days
	Malathion	5-7 days
	Lannate	3-6 days
	Entrust	3-5 days
	Pyganic	1-3 days

Beware of nu	umber of s	sprays allowed		
Example: raspberries				
Product	Pre-harvest interval	Maximum number of applications allowed (if used at max rate)		
Delegate	1 day	3		
Mustang Maxx	1 day	6		
Malathion	1 day	3		
	1	1		

Beware of number of sprays allowed					
Example: raspberries					
Product	Pre-harvest interval	Maximum number of applications allowed (if used at max rate)			
Delegate	1 day	3			
Mustang Maxx	1 day	6			
Malathion	1 day	3			
Entrust [OMRI]	1 day	4			
Danitol	3 days	2			
Brigade	3 days	2			
Hero	3 days	2			



Summary: Management of SWD on brambles

- 1. Use bait traps, check weekly
- 2. If any SWD in traps, start spray program when berries start to color - Spray* until final harvest
- 3. Do a salt test with ripe fruit, weekly, to see if program effective
- 4. Spray more often if control not good

* every 7 days if conventional: Delegate & Mustang * every 5 days if organic: Entrust & Pyganic, + sugar

Sucrose adjuvant to increase efficacy (Cowles et al. 2015)

- Assume 50 gal water/acre
- Add sucrose (sugar)
- 1 pound per acre

Sucrose adjuvant: trials • Blueberry (NJ, 2013) – Delegate & Exirel w/ sucrose 1.2 g/L – w/ sucrose: 95-100% reduction in larvae

- -w/o sucrose: 46-91% reduction
- Blueberry (NJ, 2013)
 - Delegate & Assail, w/ sucrose: 76% reduction
 - Brigade & Imidan, w/o sucrose: 65% reduction
- Strawberry (NY 2012): Entrust + sugar reduced larvae >50% vs no sugar

Insecticides for high tunnels? For products used for SWD control: •Label <u>allows</u> in greenhouses: – Malathion •Label <u>prohibits</u> in greenhouses: – Delegate – Diazinon •Label 'silent' on greenhouses therefore ok to use: – pyrethroids: Asana, Baythroid, Brigade, Danitol, Hero, Mustang, Pounce, Warrior – Lannate – Imidan – Entrust

Cultural control by prompt harvest

• harvest as soon as ripe!

Cultural control by canopy management

- Studies in Oregon & 6 other States
- Raspberry, blackberry, blueberry
- Make canopy less hospitable?
- Dense vs medium vs light canopy
- By pruning

Cultural control by canopy management

RESULTS:	Light	Medium	Dense
SWD emergence	lower	lower	higher
Canopy temperature	higher	higher	lower
SWD survival	lower	lower	higher
Marketable yield	lower	lower	higher
• Yield trade-o • Significant e	off effects in on	ly 3 of 7 State	es

Cultural control by crop floor management

- Study in 4 States: OR, MN, MI, GA
- Is SWD survival affected by
 - -Mulch?
 - -Weed mats?
- Fir sawdust vs wood chips vs bare soil
- No effect by weed mat
- SWD survival much higher below mulch than above mulch
- We need to prevent larvae from burrowing

Cultural control

- Change crops??
- Some growers unwilling to spray
- Crops least affected:
 - -June-bearing strawberries
 - -Black raspberries

Mechanical control by chilling

• <u>Chill</u> fruit as soon as harvested –Kills eggs & young larvae –8 days at 33 – 34° F

Mechanical control by sanitation

- Strongly recommended!
- Destroy ALL leftover fruit
- Do every 2 days
- Culls in <u>clear plastic bags</u> in sun, 1 week

Mechanical control by netting

- Feasible but takes planning
- Add pollinators

• Study in NY -By Dale Ila Riggs



-By Donn Johnson in AR



Mechanical control by netting

- Recent study in 3 States: MN, MI, AR
- Netting vs poly cover vs open
- Exclusion working well in small plots
- Heat a problem in poly cover
- Better quality berries
- Not sure if it can scale up

Mechanical control by removal of nearby wild hosts

- Wild blackberry
- Pokeweed
- Mock strawberry
- Tartarian honeysuckle
- Bush honeysuckle
- Silky dogwood
- Persimmon
- Rose hips

Biocontrol??

- Native natural enemies: ~2% parasitism
- Pupal parasitoids
- Exploration in Korea
 - 4 parasitoid species
 - In quarantine @ Berkeley
- Investigations:
 - Predatory insects
 - Nematodes
 - Fungi, bacteria, viruses

Your ability Timing bility Traps? Spray? Salt Test? Can trap and identify sWD adults Before 1 st SWD adults Check weekly, sort sample w/in 24 hrs (5-10 min/ trap) None yet bility If no ripe fruit: No test needed After 1 st SWD adults Check weekly, keep samples, no need to i.d. or count SWD Begin weekly sprays, until final harvest count SWD Test weekly, best 1-2 days prior to spray	SWD management approaches					
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Identify adults detected 24 hrs (5-10 min/ trap) None yet If ripe fruit present: Test is optional After 1st Check weekly, SWD Begin weekly Test weekly, best 1-2 detected count SWD one do i.d. or final harvest days prior to spray	Can trap and	Before 1st SWD	Check weekly, sort sample w/in	None yet	If no ripe fruit: No test needed	
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SWD management approaches

Your ability	Timing	Traps?	Spray?	Salt Test?
Can trap and	Before 1 st SWD	Check weekly, sort sample w/in	None yet	If no ripe fruit: No test needed
identify SWD adults	detected	24 hrs (5-10 min/ trap)	None yet	If ripe fruit present: Test is optional
	After 1 st SWD detected	Check weekly, keep samples, no need to i.d. or count SWD	Begin weekly sprays, until final harvest	Test weekly, best 1-2 days prior to spray
Can trap but <u>not</u>	Before any fruit is ripe	No traps	None yet	If no ripe fruit: No test needed
identify SWD adults	As soon as any fruit is ripe	No traps	Begin weekly sprays until harvest	Test weekly, best 1-2 days prior to spray

Additional info on SWD

On website: u.osu.edu/pestmanagement

- 2-page color info sheet – Includes insecticides for commercial farms
- Instructions for trapping
- Instructions for salt tests
- Insecticide list for home gardens
- Slide show



Info on veg & fruit pest management: u.osu.edu/pestmanagement

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