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Long term management of Spotted wing drosophila



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Spotted wing drosophila (SWD)

Drosophila suzukii




Photo by [Cornell University](#)

- Invasive pest, native to Southeast Asia
- First detected in US in 2008
- Widely established around North America
- Unlike other common fruit and vinegar flies, SWD targets intact fruits while they are still ripening on the plant making them unmarketable


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Hosts



Attack a wide variety of cultivated fruits- cherries, grapes, berries, and peaches



Wild hosts- honeysuckle, wild grapes, mulberry, elderberry, buckthorn


NYU Extension
Photo: Mark Ludwig

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Damage

- \$500 million in economic damage to fruit crops in the U.S. each year
(Entomology today.org Roche,2021)
- Higher risk: raspberries, blackberries and blueberries and without control measures, can suffer upwards of 80% crop loss.
- Fall-bearing and late maturing varieties are at greater risk than early maturing ones



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Research efforts to manage Spotted wing drosophila (SWD)

- Monitoring
- Chemical control
- Behavioral control
- Biological control

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Monitoring is critical for efficient management

- when management efforts need to be applied, increasing effectiveness
- delays in applying insecticides until they are needed, reducing environmental impacts and economic costs by saving sprays

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Monitoring of SWD adults

- Most common trap (Deli cup/liquid trap) with an attractive bait and a drowning solution
- Dry red sticky panels are an easier to use alternative to liquid traps

Traps integrating (red visual cue + olfactory cue) captured more SWD than the clear deli-cup traps

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New York farm's dry and wet trap trials in 2021

Emmi site 1

Emmi site 2

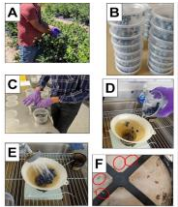
G&S orchard

Blue Barn

Dry red sticky traps are more effective to capture SWD than wet traps

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Monitoring of SWD larvae




- A. Collect berries
- B. Put the berries in the cups
- C. Crush the berries
- D. Add salt solution and leave for an hour
- E. Filter the solution through mesh
- F. Count the SWD larvae

Salt flotation to check for SWD larvae


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Monitoring of SWD in NY- 2022

Red Sticky Trap baited with lure



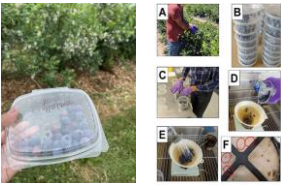
To simplify monitoring for SWD for risk assessment and initiating control



- Four different sites (June-August)
- Collaboration with grower influencers

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Correlate male capture with fruit infestation levels to optimize SWD monitoring



Goal: develop economic based aid tool to help growers to make optimal SWD control decisions

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Majority of control efforts for SWD rely on chemical control

- weekly insecticide applications
- Insecticides can be very effective, but they have disadvantages:
 - non-target effects
 - health risk
 - secondary pests
 - insecticide resistance
 - costly

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Insecticide resistance trial



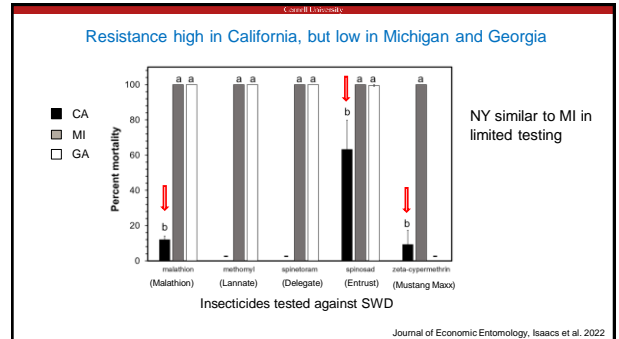
RAPID = Rapid Assessment Protocol for Identification of resistant SWD populations

Van Timmeren et al. Pest Manage. Sci. 2019

Dose-Response Panel:

- malathion
- methomyl
- spinetoram
- spinosad
- zeta-cypermethrin
- bifenthrin
- fenpropathrin
- acetamiprid
- cyantraniliprole

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How can we manage Insecticide Resistance?

- Maximize number of effective active ingredients used in rotation programs
- Consider putting "high toxicity" materials first in a rotation program
- Avoid treating non crop areas
- Participate in resistance monitoring efforts
- Report concerns about control failures

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Behavioral control of SWD

-interfere with the flies' ability to find hosts, feed, or lay eggs.

Behavioral manipulation strategies:

- Mass trapping
- Attract and kill
- Repellents
- Combing attractants and repellents (push-pull)


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Behavioral manipulation using repellent

Discovery of 2-Pentylfuran

Compound	# SWD repulsions
SWD lure	~65
1-pentanol	~55
2,3-butenediol	~50
1-heptanol	~35
Phenyl acetate	~25
Ethyl acetate	~20
Nonanal	~15
2-octanone	~10
Isobutyl formate	~8
1-octen-3-ol	~5
Compound 1	~4
Compound 2	~3
Control	~2
2-pentylfuran	~75

2-Pentylfuran



Repel SWD

Pest Manag Sci, 2021: Cha et al.

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Tested 2-Pentylfuran on a small scale

Treatment	# Eggs/Fruit
Control	~2.1
2-pentylfuran	~0.9

Reduce fruit infestation


Pest Manag Sci, 2021: Cha et al.


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Puffer to deploy 2PF repellent in the field

Features of Puffer

- Automated dispenser
- Release 8 mg per puff (puff every 10 min.)
- Time set up: 6 am to 10 pm (16 hours/day)




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Summer-bearing raspberries

- produce fruit on the floricanes in the summer
- low SWD pressure




Row 1 Row 2 Row 3

Heritage raspberries, each row being about 20' long and spaced 7' apart.

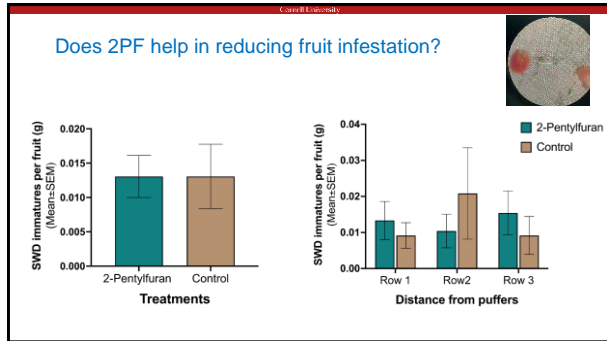


Puffer set up ~3 weeks (June-July)

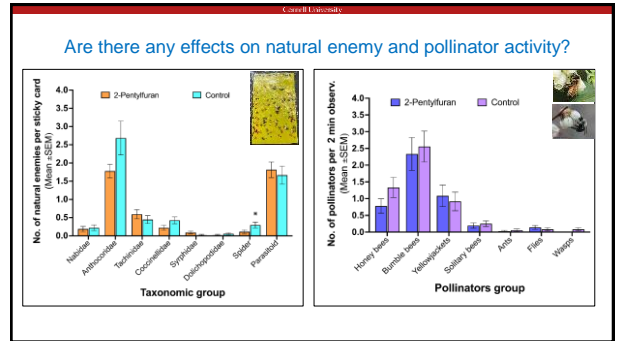


SWD flies were released after 24 hours of puffer set up

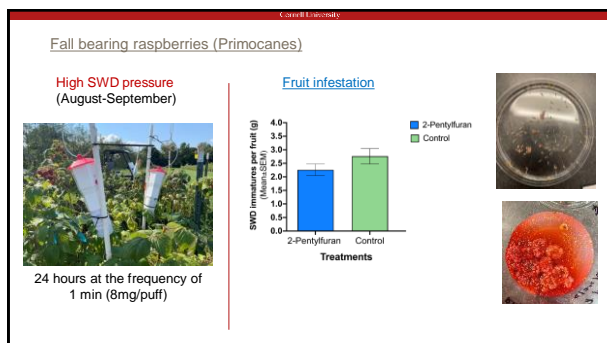
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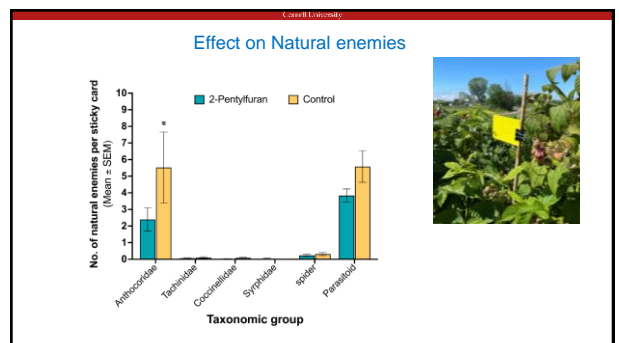
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Biological control- Parasitoids

Augmentation of native parasitoids

Pupal parasitoids



Pachycrepoideus vindemiae




Trichopria drosophilae

- Augmentation trials showed increased parasitism in some cases, but not economically important differences
- Still in experimental phase, not yet commercially available in USA

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Importation Bio-Control



G1 - *Ganaspis brasiliensis* (Figitidae)

- 3 different species tested
- This species selected for safety and efficacy

Federal approval to release in US



Leptopilina japonica (Figitidae)

Not approved for release because it has a slightly wider host range

- Accidentally made it to many areas in the Northeast and down to at least NC
- Found in several sites before releasing *Ganaspis*

Larval parasitoids

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Ganaspis releases in NY- 2022

- Released in wild habitat
- At four sites: 300 parasitoids (2 weeks)

Surveys of parasitoids establishment

- ✓ sampling of fruits from wild hosts
- ✓ sentinel traps baited with infested fruit



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Future directions

- Improve monitoring methods to develop economic-based tools for SWD control
- Optimize the deployment method of 2PF in combination with other control measures
- Test the compatibility of 2PF with the parasitoid, *Ganaspis brasiliensis*
- Evaluation and optimization of *G. brasiliensis* releases and establishment
- Push-pull approach under field conditions



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Questions??



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