

# Blueberry Insect Update



**Ash Sial**

*Department of Entomology*  
*University of Georgia*

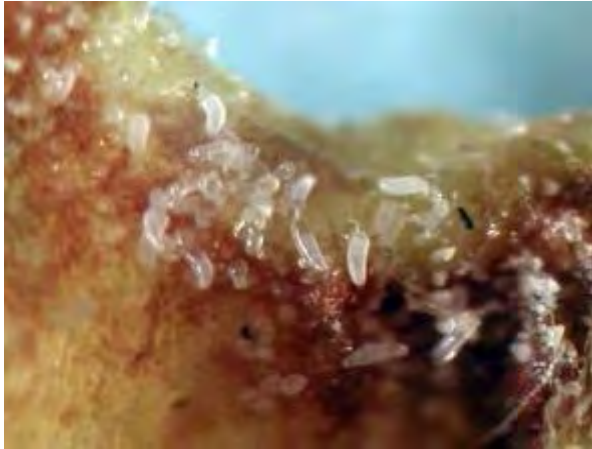
# Economically-important activity periods of arthropod pests\*

Insect Pest	pre-bloom		bloom		mid-season		pre-harvest		harvest		post-harvest	
Bb bud mite												
Scales												
Borers												
Gall midges												
Thrips												
Aphids												
Leafhoppers												
Cranberry FW												
Cherry FW												
Plum curculio												
BB maggot												
Spotted-wing drosophila												
White grubs												
Ground pearls												
Chilli thrips												

\*grey bars show period when scouting and management of the pest is most important

# Blueberry Bud Mite

(*Acalitus vaccinii* Keifer )



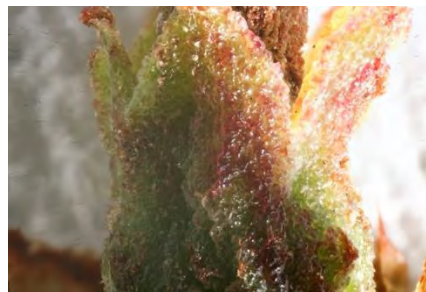
- Eriophyid family of mites
- Transparent to whitish body, 1/128 inch long (approx. 200 micron)
- Females lay approx. 200 eggs
- Develop through 4 stages to complete lifecycle in 15 days at 19 °C
- Disperse primarily by air. May also disperse by crawling or hitch-hiking
- Populations peak in Dec – Feb and decline in summer due to high temps
- Mild winters tend to boost populations leading to severe bud damage in spring

# Blueberry Bud Mite

(*Acalitus vaccinii* Keifer )



- Continuously remain protected & feed inside the buds
- Transfer toxin which makes tissues roughened & blistered
- Persistent feeding causes reddening & swelling of the base of bud scales which makes buds appear rosetted
- Buds may desiccate and fail to open
- Flowers and berries developing from infested buds usually have small blisters and pimples
- Summer generations cause retarded leaf & vegetative growth which negatively affects following year's crop





# Blueberry Bud Mite

(*Acalitus vaccinii* Keifer )



## Sampling

- Bud mites move to fruit buds formed this year to find places to spend the winter
- To detect infestation, take shoot samples in the late summer and fall
- Take 10 randomly-selected shoots
- Sample the top 5 fruiting buds on each shoot for a total of 50 buds per field
- Examine the scales of dissected buds under a microscope at 40X magnification
- Treatment may be needed if 10 percent of the sampled buds are infested



# Blueberry Bud Mite

(*Acalitus vaccinii* Keifer )

## Control

- Postharvest pruning and removing of old canes will reduce bud mite population
- Insecticides/miticides: Portal, Oberon, Acramite, Brigade, Danitol, Sevin, Abamectin, Movento, horticultural/superior oils (2% by volume)
- Use high volume, high pressure (200 psi) applications of insecticide/miticide or horticultural oil
- Interior spaces of the bud scales must be wetted to get good control
- Using surfactants to improve spreading and penetration of the spray is expected to increase control of bud mites

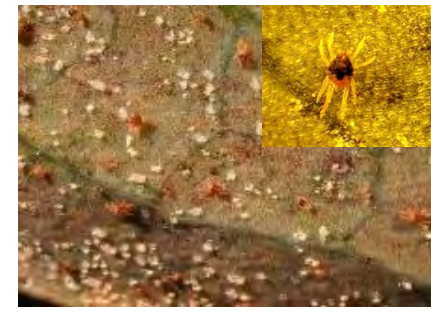
**Spray timing and coverage are key to successful control**



# Spider Mite

## Southern red mite

(*Oligonychus ilicis* McGregor)



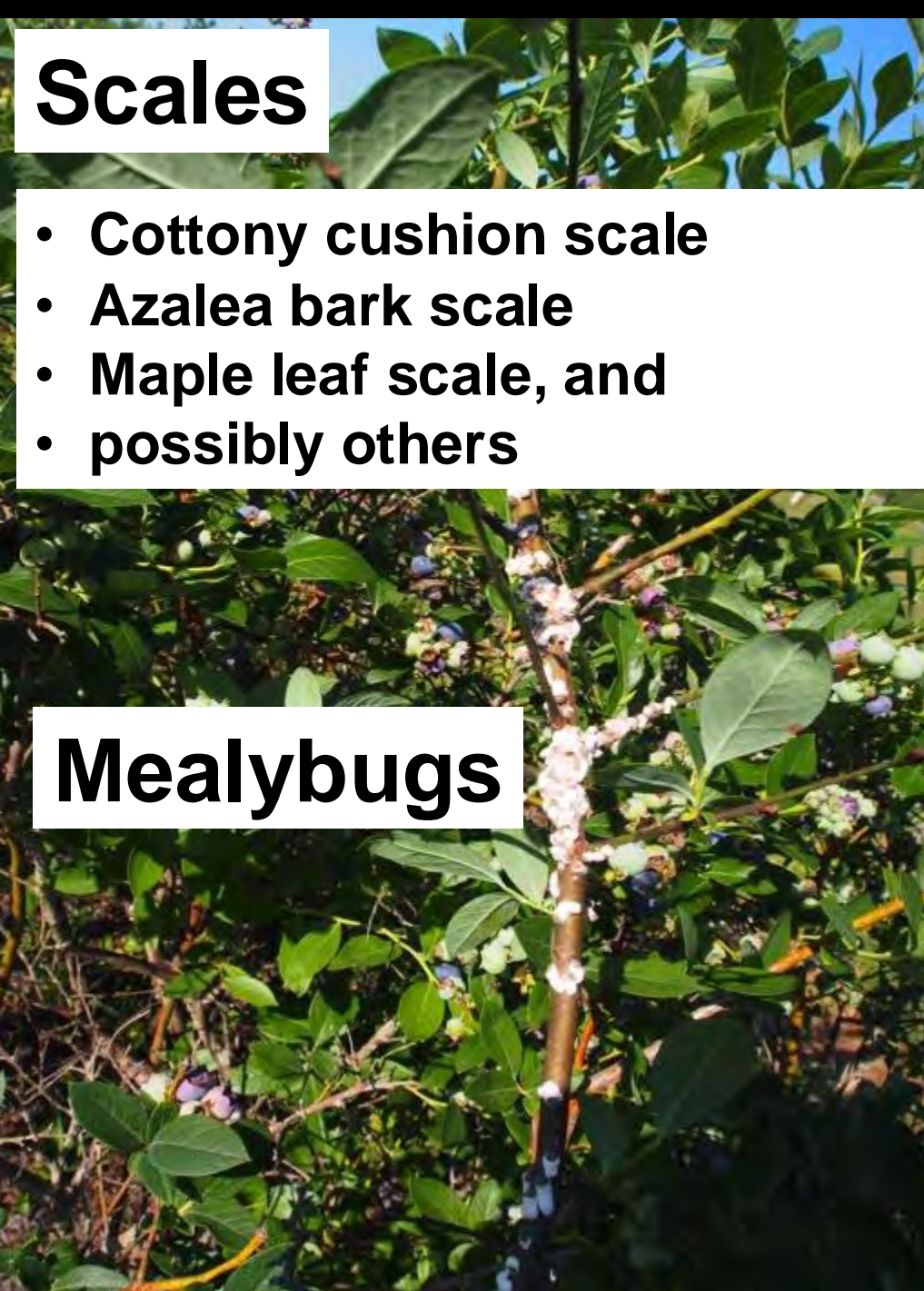
- Spider mites are also known as web-spinning mites
- Southern red mite is common pest of blueberries in southern US
- Spider mites feed on plant tissues by sucking cell sap which compromises plant's ability to utilize sunlight for photosynthesis
- Leaf bronzing is the characteristic symptom of mite injury
- They can complete one generation in two weeks
- Can build up high populations in relatively short period of time and cause economic damage
- **CONTROL: Miticides - Portal, Oberon, and Acramite**



# Scales

- Cottony cushion scale
- Azalea bark scale
- Maple leaf scale, and
- possibly others

# Mealybugs





# Scales

## Control:

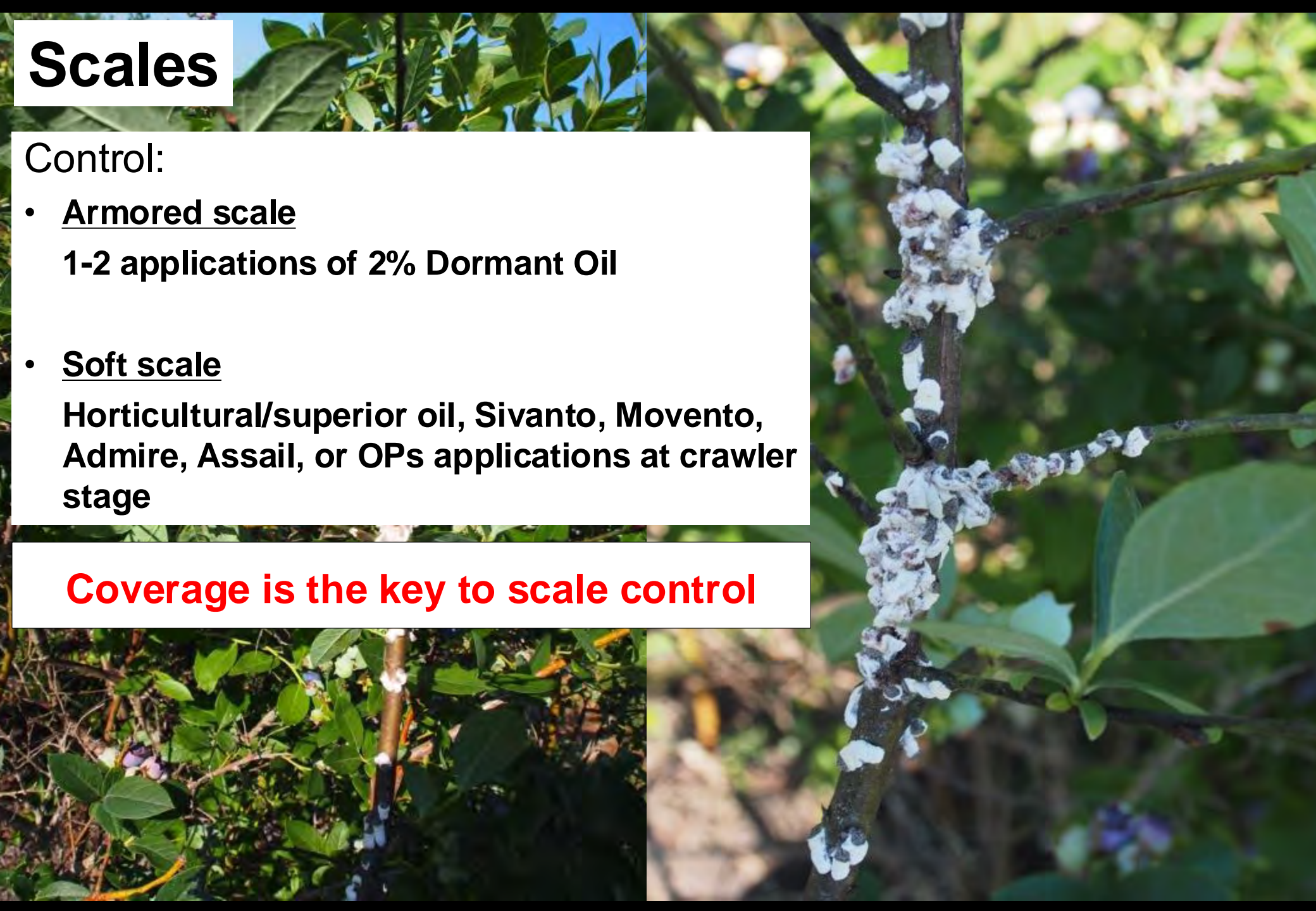
- Armored scale

1-2 applications of 2% Dormant Oil

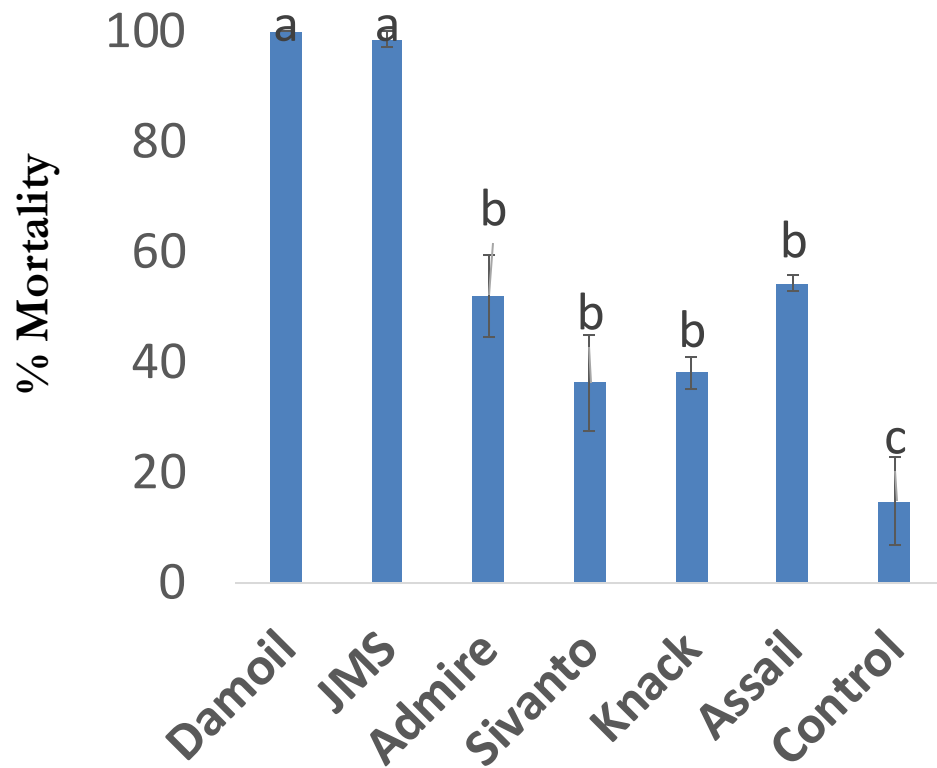
- Soft scale

Horticultural/superior oil, Sivanto, Movento, Admire, Assail, or OPs applications at crawler stage

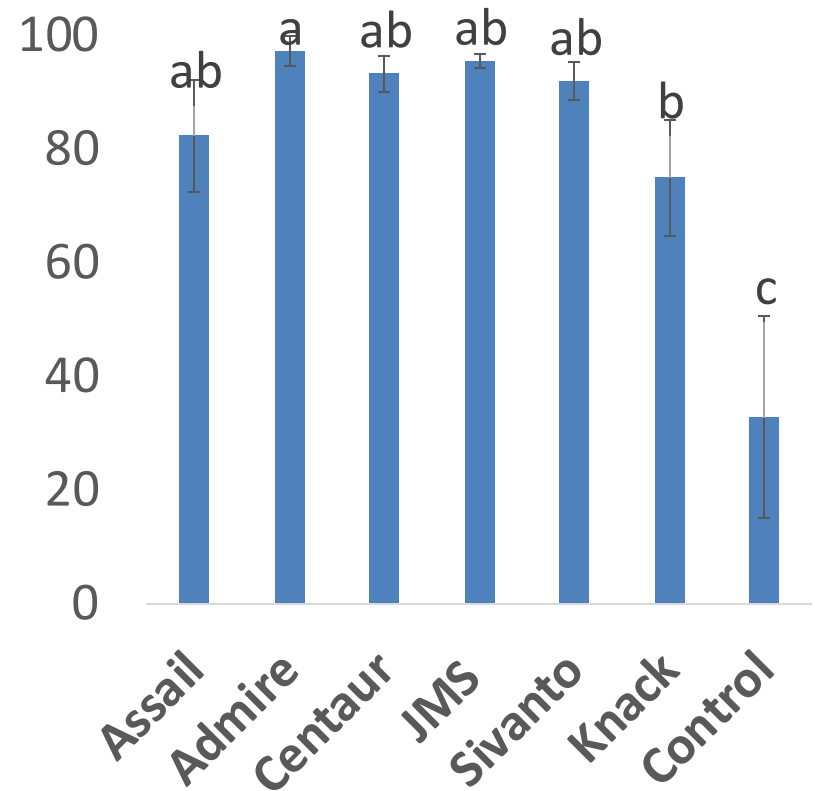
**Coverage is the key to scale control**



**Scale mortality**  
(Treatments applied in November)



**Scale mortality**  
(Treatments applied in August)



# Blueberry Gall Midge (~3 mm)

male



female



- Females lay eggs in flower & vegetative buds as bud scale separate, late Stage 2
- Flower buds are susceptible in stages 2, 3 (February to March for Rabbiteye)
- Up to 80% flower bud loss (Lyrene, FL 2004)
- Midge injury is easily underestimated: Midge-aborted flower buds are readily mistaken for cold injury or poor pollination

Larvae/maggots





# Blueberry Gall Midge



## Monitoring

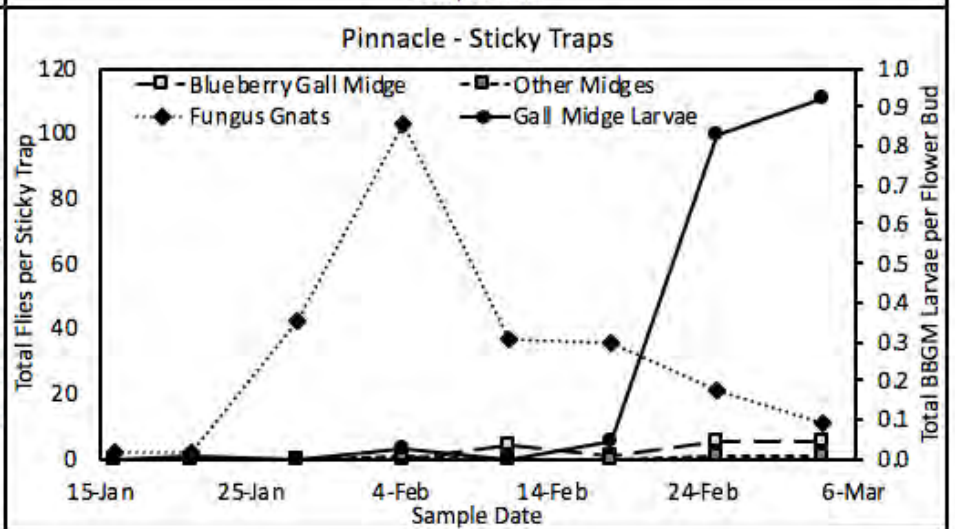
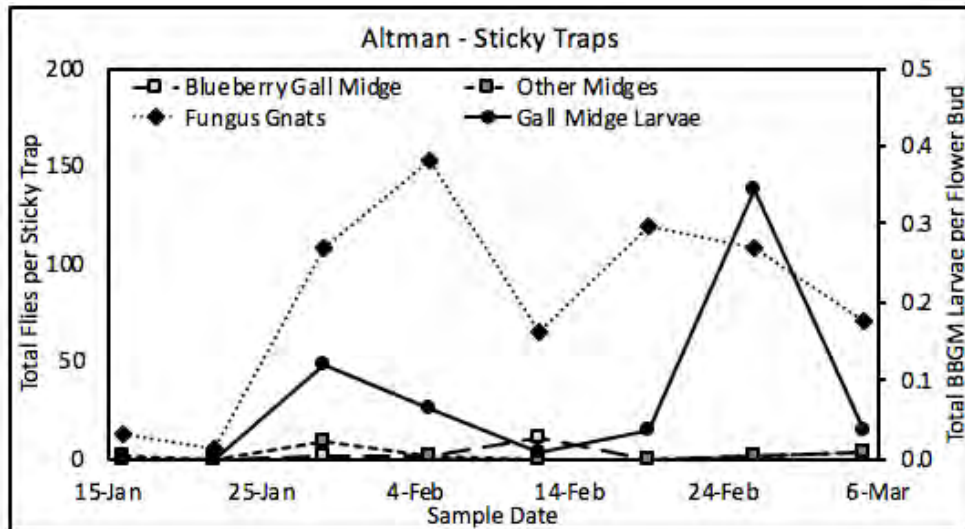
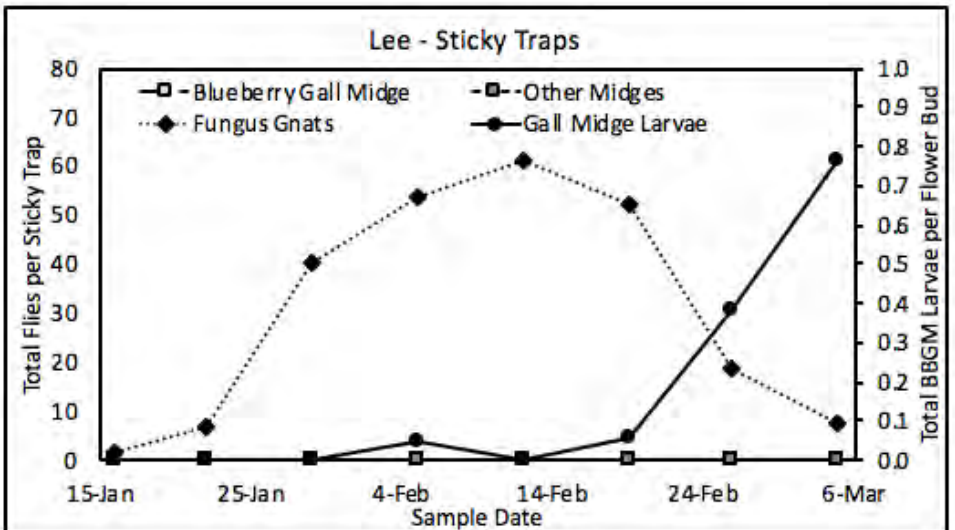
- Collect flower buds 2 to 3 times per week
- Place them in zip-lock bags to monitor for larval infestation
- Use double-sided sticky sheets to capture adults
- Use bucket traps to monitor adult emergence (may be less efficient)



# Blueberry Gall Midge Monitoring



Fungus gnat abundance peaked 2-3 weeks before gall midge infestation peaked.







# Blueberry Gall Midge Identification

Craig R. Roubos and Ashfaq A. Sial

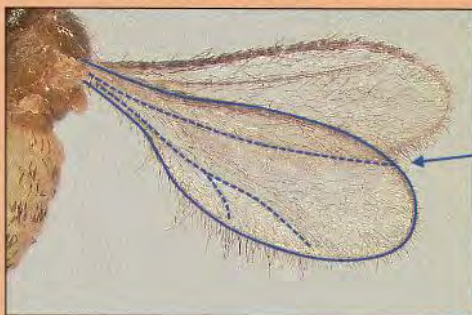
Department of Entomology, University of Georgia, Athens, GA



## Importance of Correct Identification

Monitoring is a cornerstone of integrated pest management. This means that the presence of a pest is confirmed before control actions, such as insecticide applications, are taken. For monitoring to work, one must use the appropriate sampling method and correctly identify the specimens collected. Misidentification could mean failing to apply insecticides when they are needed or applying insecticides unnecessarily. This is important for blueberry gall midge because the most vulnerable stage is the adult (eggs and larvae are in the plant and pupae are in the ground) and it can be active at the same time as pollinators.

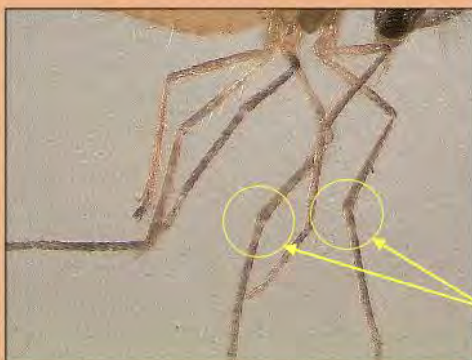
## Adult Characteristics



Few wing veins

Vein meets edge before wingtip

Wings covered with hairs



Light orange body

Long legs

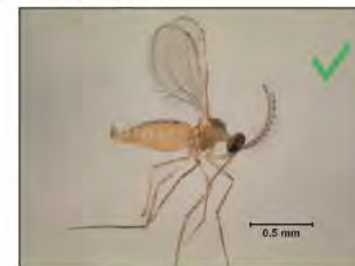
No spurs on legs

## Other Small Flies

Don't be fooled by imposters



Blueberry Gall Midge Female



Blueberry Gall Midge Male



Fungus Gnat



Fungus Gnat



Phorid Fly

## Non-midges:

Too many wing veins  
Few or no hairs on wings  
Spurs present on legs



# Blueberry Gall Midge (~3 mm)

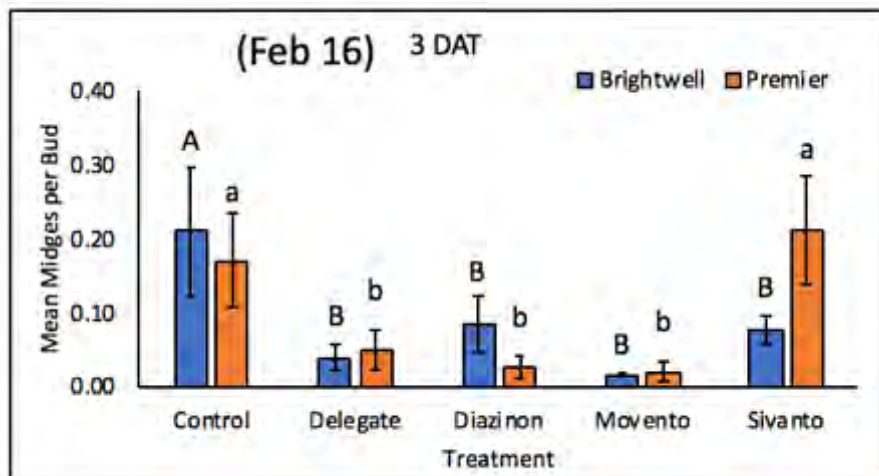
## Control:

- Flower bud stage-2 to bloom/fertilization is the window of vulnerability
- Must protect stage-2 up to bloom when weather is mild
- Diazinon early, followed by Delegate, Entrust (organic), Assail, Sivanto, Movento, and Apta
- Midge insecticides are protectants:
  - They don't control existing larval infestations
  - Thorough coverage is a must

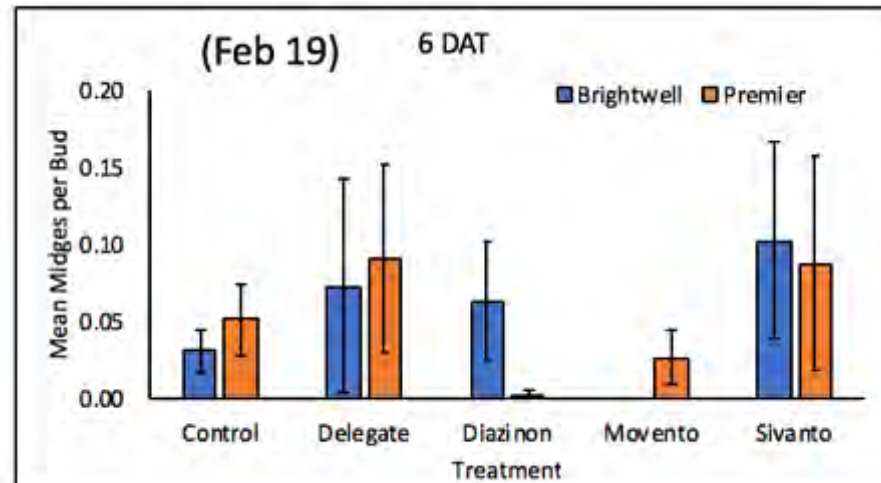


**Spray timing is the key to gall midge control**

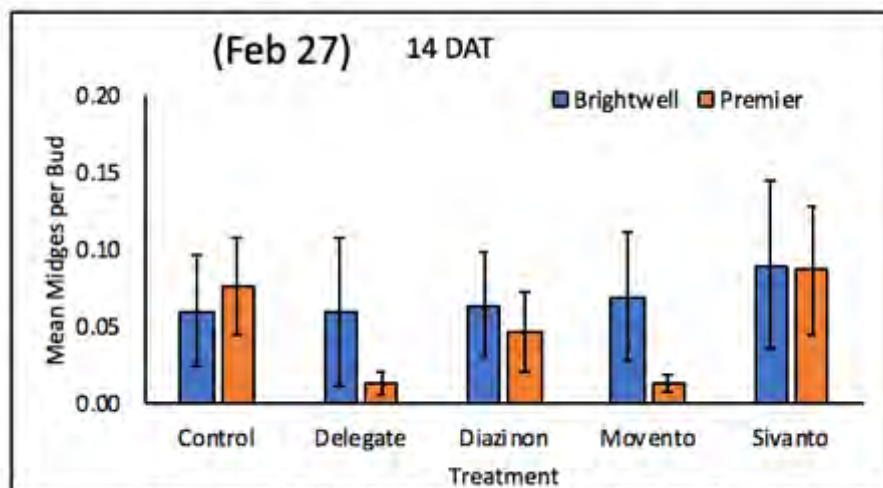
# Gall Midge



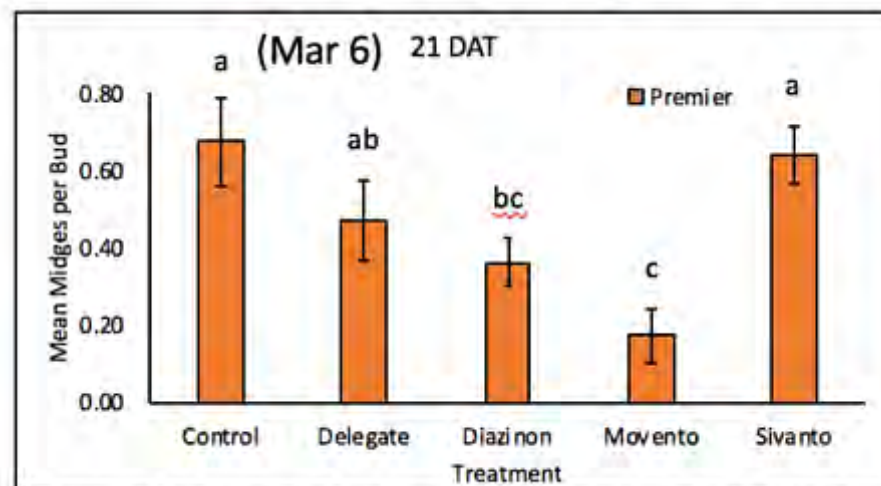
Bars with the same letter are not statistically different



No statistical differences among treatments



No statistical differences among treatments



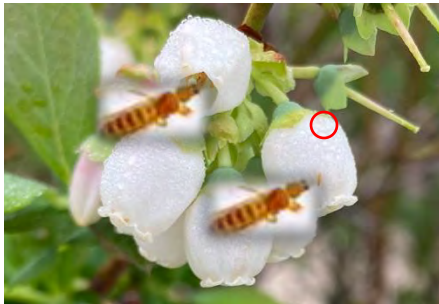
Bars with the same letter are not statistically different

# Flower Thrips (1-2 mm)

- Many species found in Georgia blueberries  
(*Frankliniella tritici*, *F. occidentalis*, *F. bispinosa*)
- Feed on leaf and flower surfaces
- Active before, during, and after bloom
- May move from other flowers to blueberry
- Feed on the internal parts of flowers, reducing pollination and fruit set
- Damage to southern highbush can cause up to 60% lower fruit set (GA)
- Cause tight curling and malformation of leaves



Injury to flowers



Feeding Injury

Injury to fruits

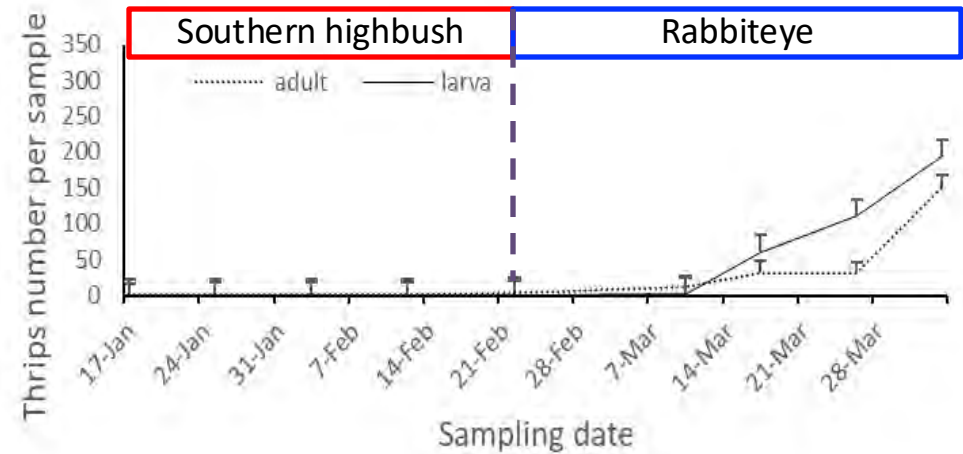




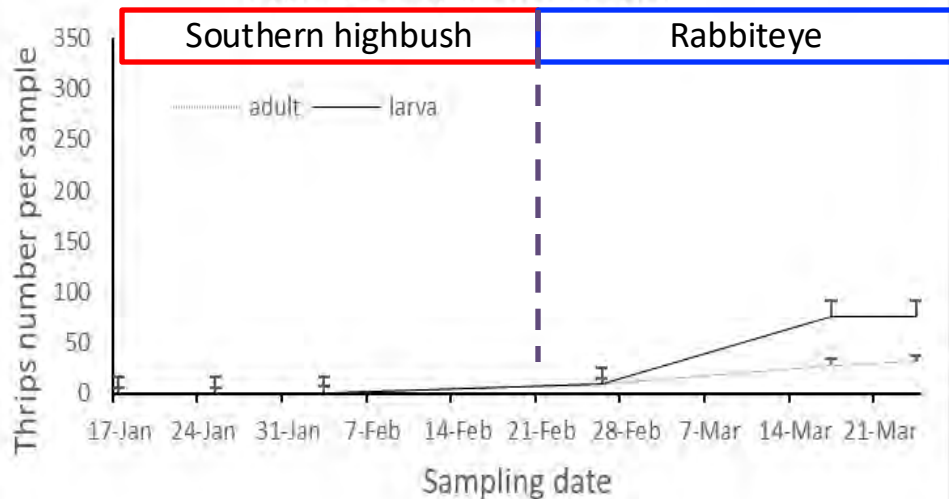
# Flower Thrips (1-2 mm)



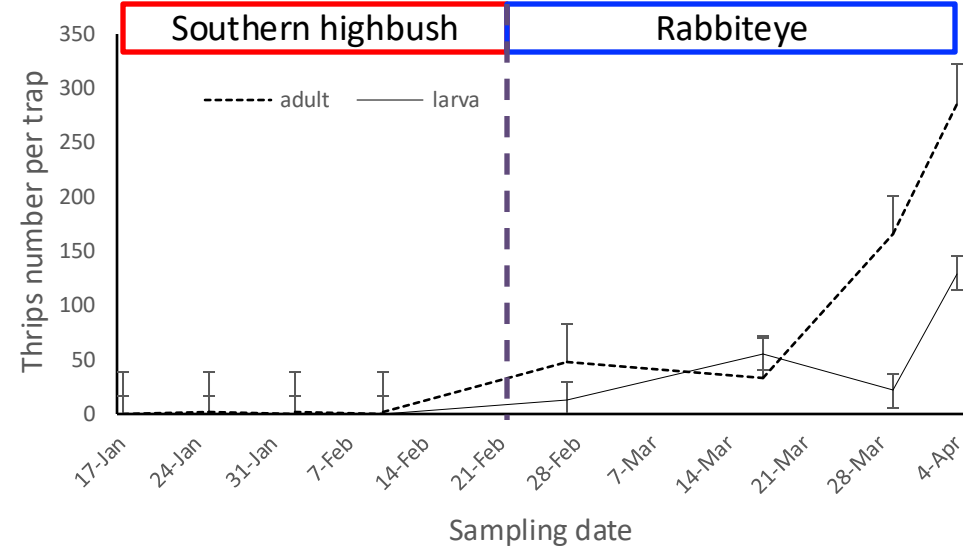
Bacon county (flower sample)



Appling county (Flower sample)



Pierce county (Flower sample)





# Flower Thrips (1-2 mm)

## Monitoring:

- Sample 2 to 3 times per week beginning with Stage 3
- Place bloom clusters in sealed bags to drive thrips out

## Thresholds:

- > 2 per cluster of eight flowers

## CONTROL:

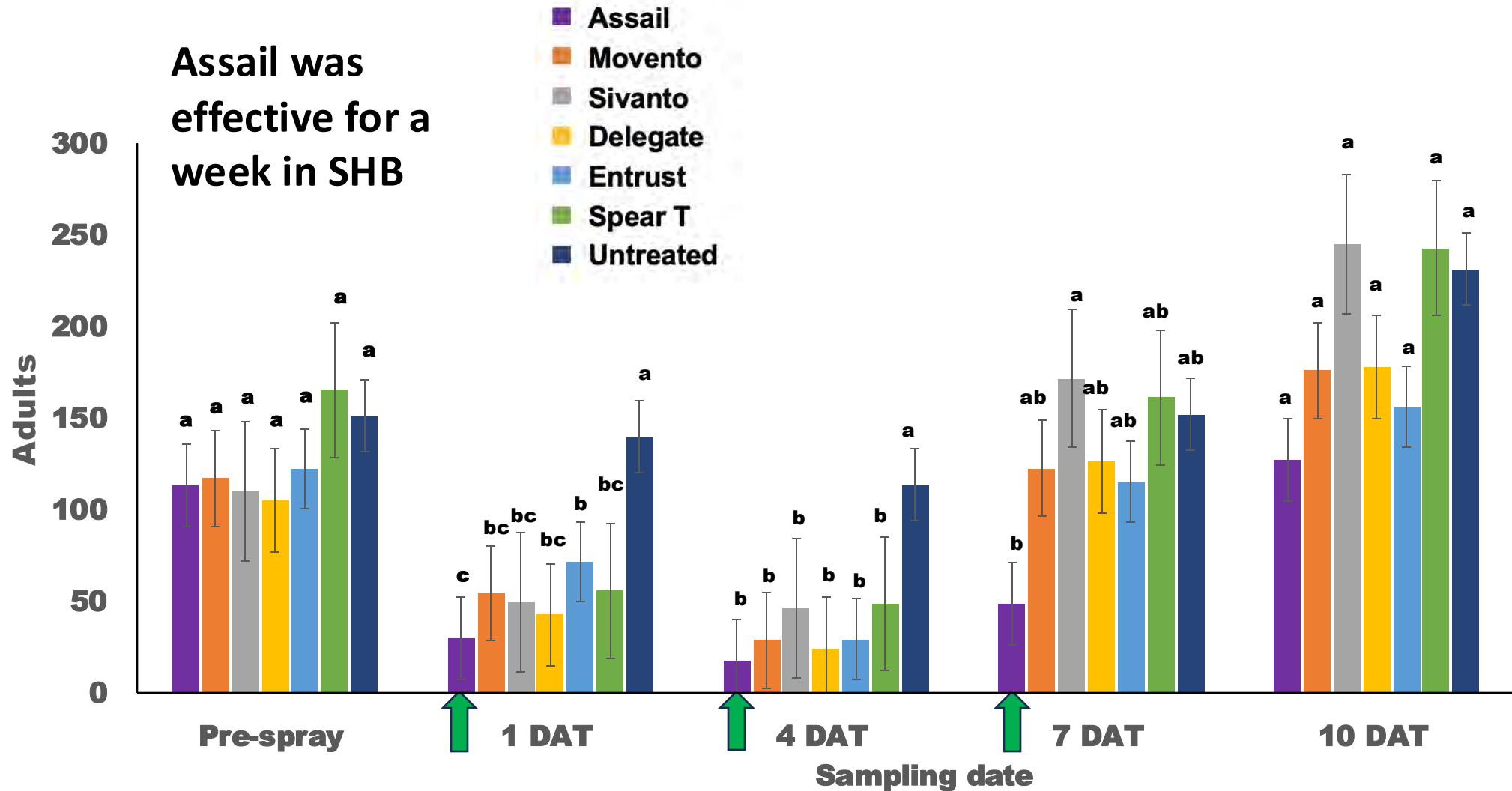
- Diazinon early, followed by Entrust, Delegate, Assail, or Sivanto





# Thrips Management

Assail was effective for a week in SHB



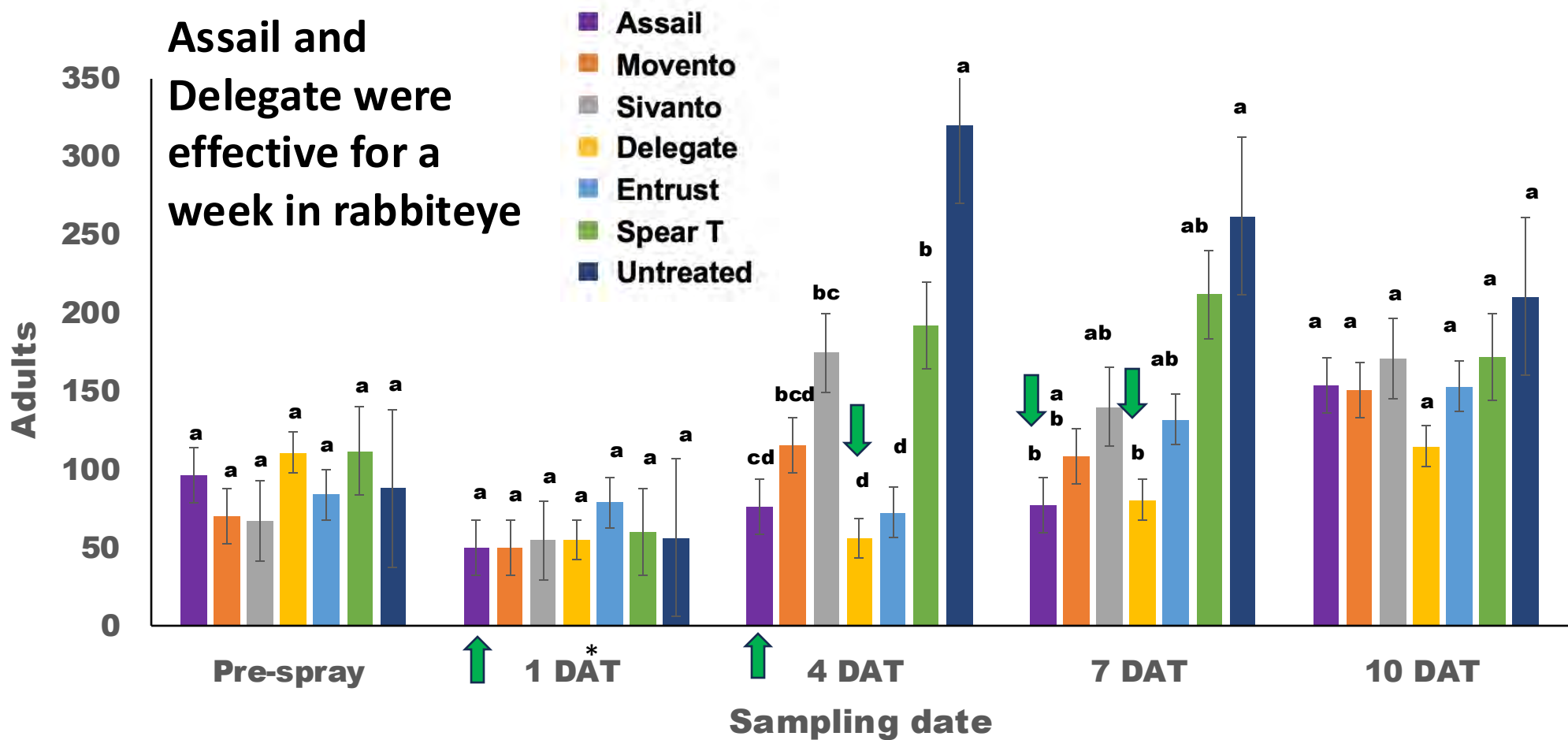
Insecticide efficacy against flower thrips adults in southern highbush blueberry





# Thrips Management

Assail and Delegate were effective for a week in rabbiteye

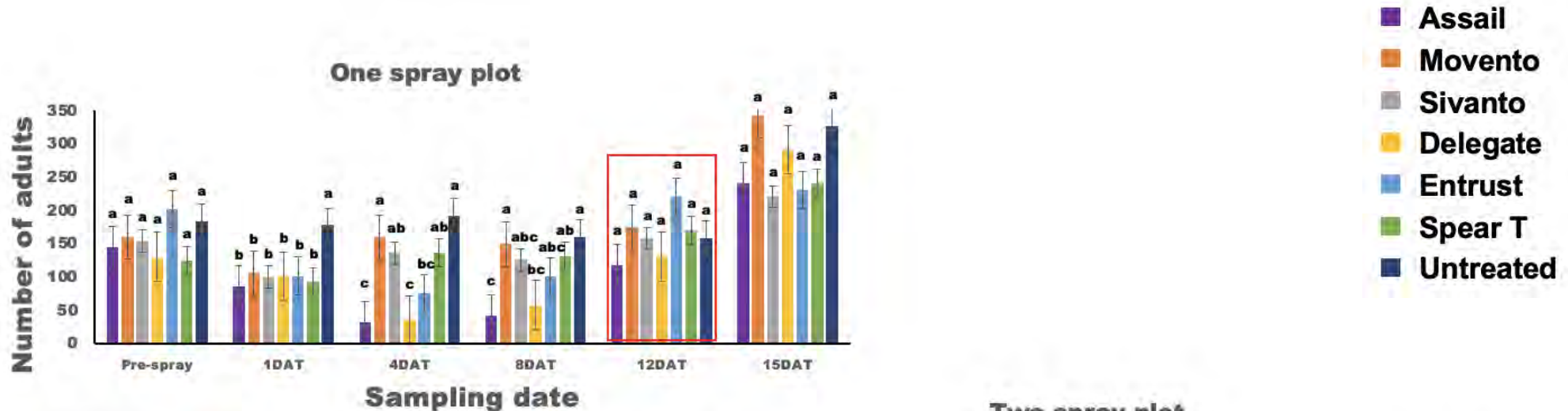


Insecticide efficacy against flower thrips adults in rabbiteye blueberry

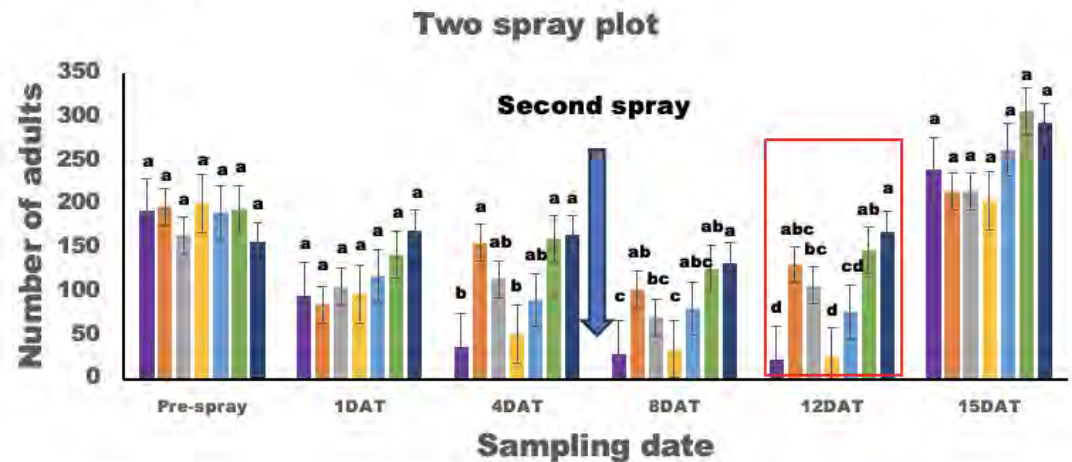


# One spray vs. Two sprays

(Second spray was done after a week of first spray)



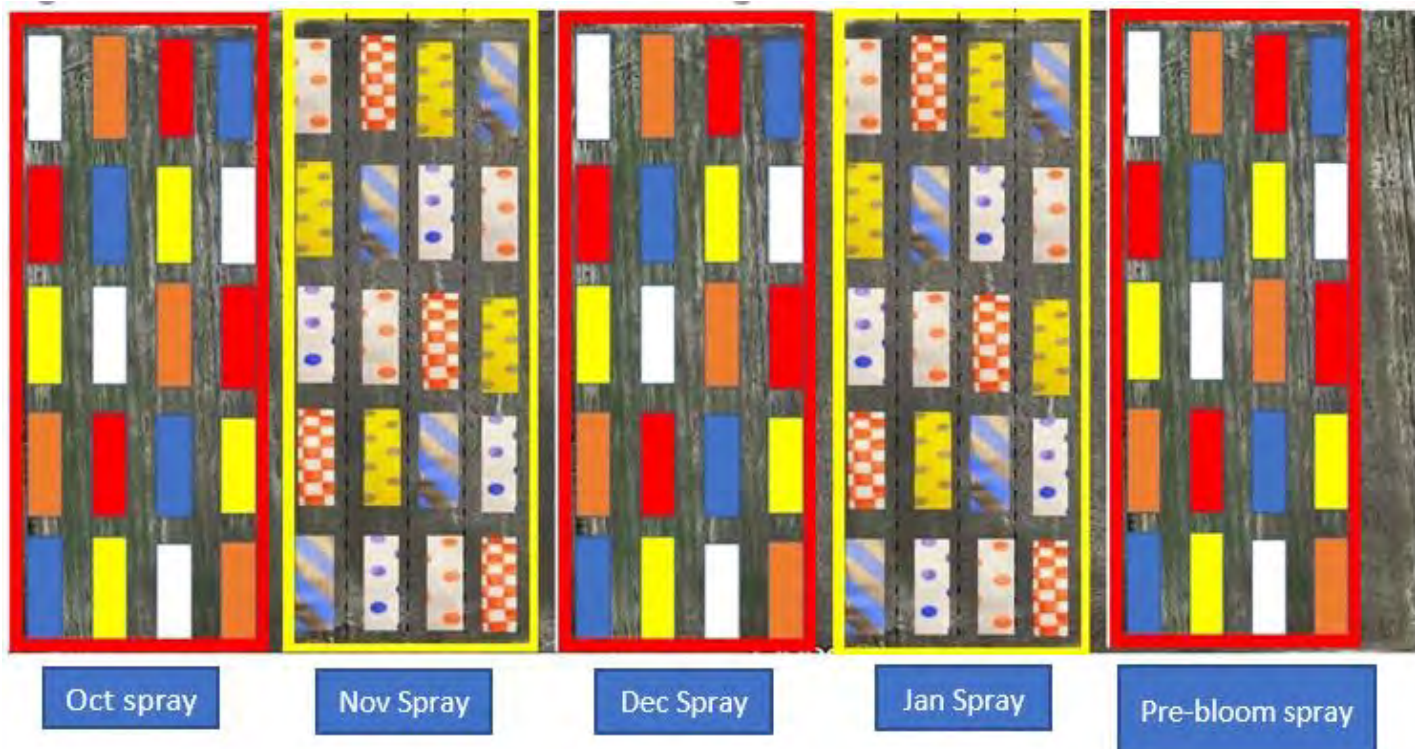
- One spray: Insecticides were effective up to 7-8 days
- Two spray: Insecticides were effective up to 12 days





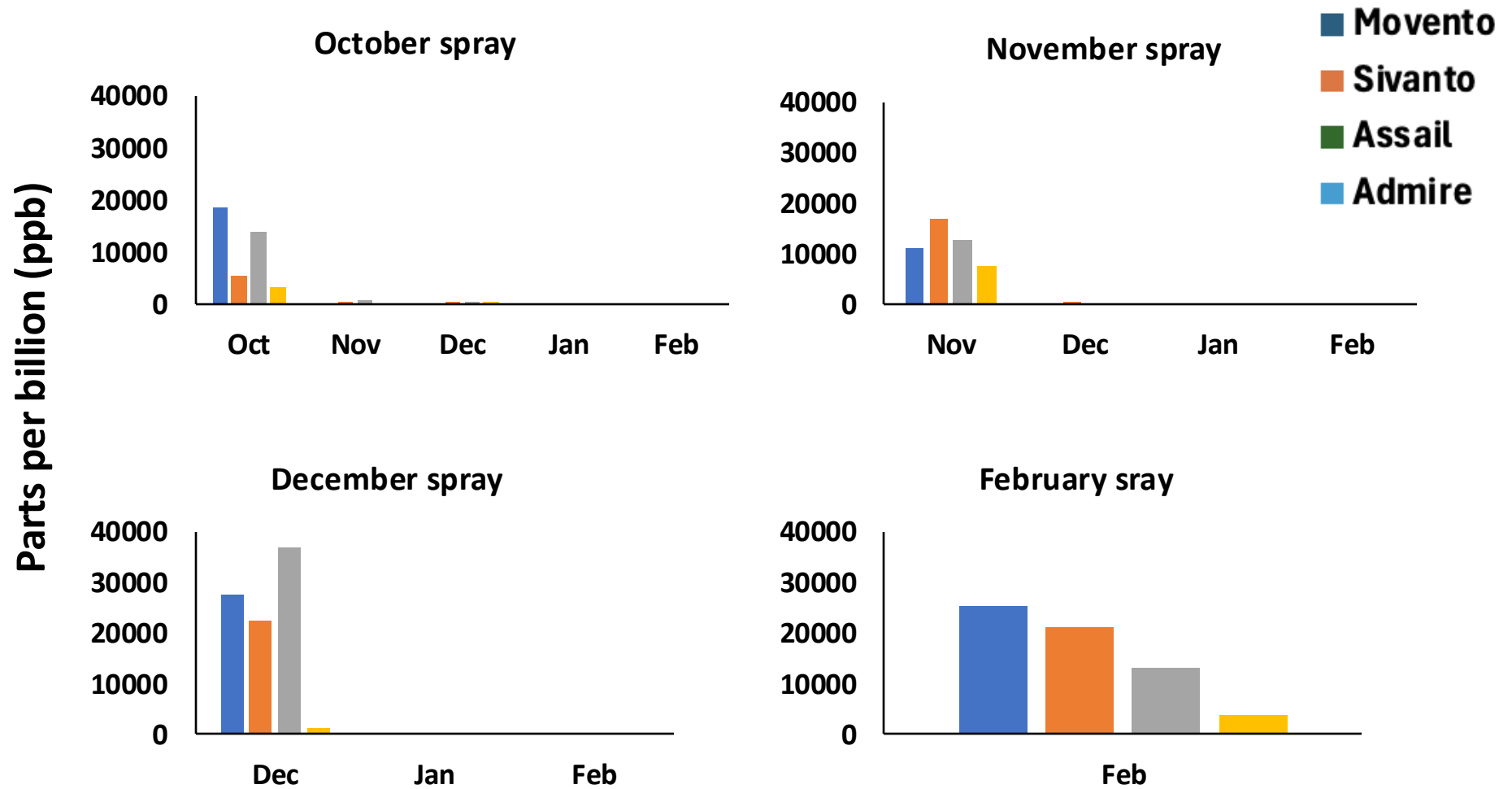
# Residual Longevity of Systemic Insecticides

Product	Flag color	Active ingredient	Rate
Assail	RED or Stripe blue/black	Acetamiprid/Assail	5.3 Oz/acre
Movento	YELLOW or Checker white/red	Spirotetramet/Movento	10.0 Fl oz/acre
Sivanto	ORANGE or Polka dot white/blue	Flupyradifurone/Sivanto	14.0 Fl Oz/acre
Admire	BLUE or Yellow/black dot	Imidacloprid/Admire	2.8 Fl oz/acre
Control/no spray	WHITE or Orange dot/ white	N/A	N/A





# Residual Longevity of Systemic Insecticides



# Chilli Thrips

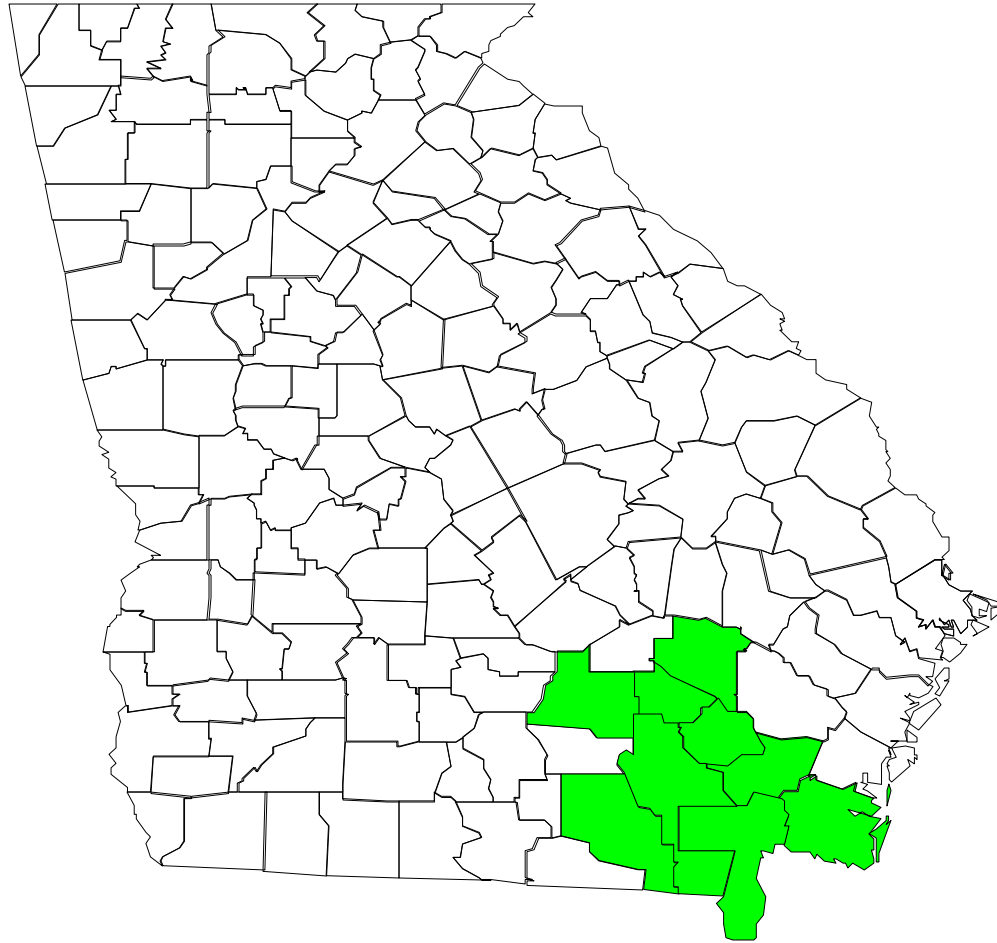
- Invasive species from Asia
- Recently found on Georgia blueberries
- Appears later in the season
- Chilli thrips can be distinguished from flower thrips by its:
  - smaller size
  - incomplete dark stripes on its abdomen
  - dark wings



Flower thrips

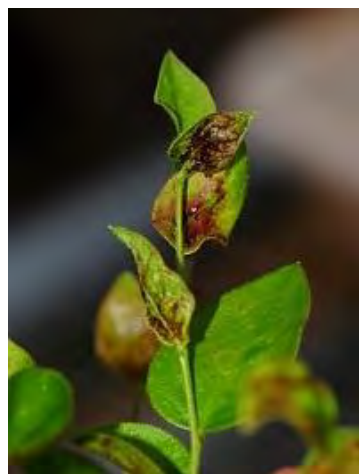
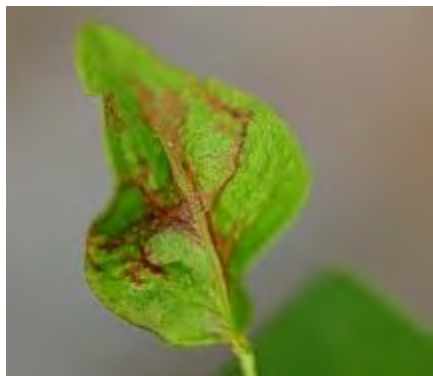
Chilli thrips

# Chilli Thrips Detections in GA



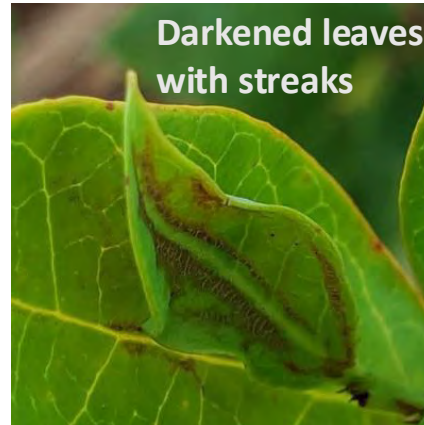


# Injury from chilli thrips on young blueberry plants



- Chilli thrips are more injurious than flower thrips
- Young blueberry foliage are damaged in late spring to early summer just after the bushes are pruned
- The injury includes bronzing, curling, and darkening leaves with streaks
- Thrips injury usually starts on the dorsal part of young leaves and gradually expand to all areas of the leaf blade
- Chilli thrips affect plant vigor and reduce the number of berries the following season
- Multiple sprays are needed to control chilli thrips

# Injury in mature blueberry bushes



Reduce plant vigor and number  
of berries the following season

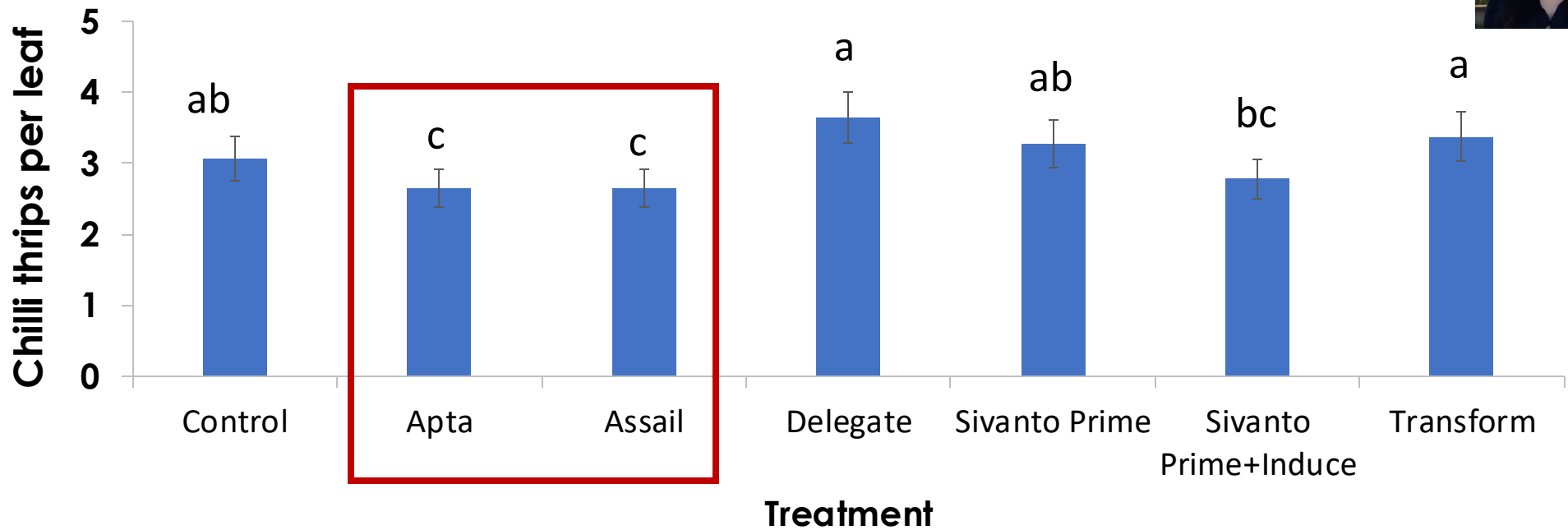
Photos by B. Panthi, L. Buss, and S. Lahiri

# Insecticide Treatments

Treatment (Active Ingredient, AI)	Insecticide Brand Name	Rate (AI/ac)	Group No.	Mode of Action
Tolfenpyrad	<b>Apta® 15 SC</b>	27 fl oz/acre	21A	MET I
Acetamiprid	<b>Assail® 30 SC</b>	5.3 oz /acre	4A	Neonicotinoid
Spinetoram	<b>Delegate® WG</b>	7 oz/acre	5	Nicotinic receptor allosteric modulator
Flupyradifurone	<b>Sivanto Prime®</b>	14 fl oz/acre	4D	Butenolides
Flupyradifurone + Nonionic Low Foam Adjuvant	<b>Sivanto Prime® + Induce®</b>	14 fl oz/acre + 0.25 v/v	4D	Butenolides + ethers and free fatty acids
Sulfoxaflor	<b>Transform® WG</b>	2.25 oz/acre	4C	Sulfoximines
Control (water)	<b>NA</b>	NA	NA	NA



# Performance of various insecticides on larval and adult thrips in blueberry (2020)



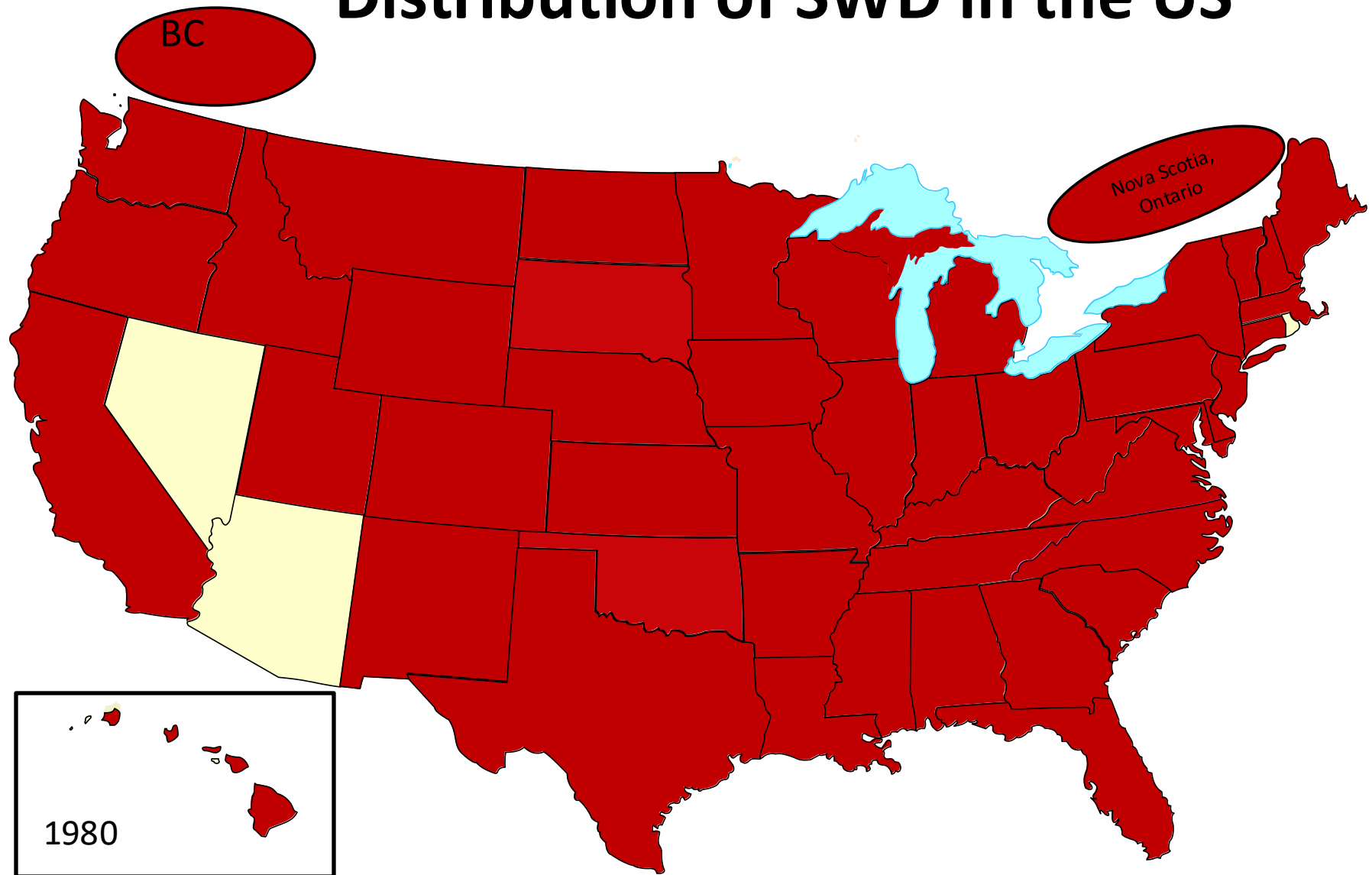
# Economically-important activity periods of arthropod pests\*

Insect Pest	<div>pre-bloom</div> <div>bloom</div> <div>mid-season</div> <div>pre-harvest</div> <div>harvest</div> <div>post-harvest</div>																							
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\*grey bars show period when scouting and management of the pest is most important

# Spotted-Wing Drosophila (SWD)

## Distribution of SWD in the US





# Spotted-Wing Drosophila (SWD)

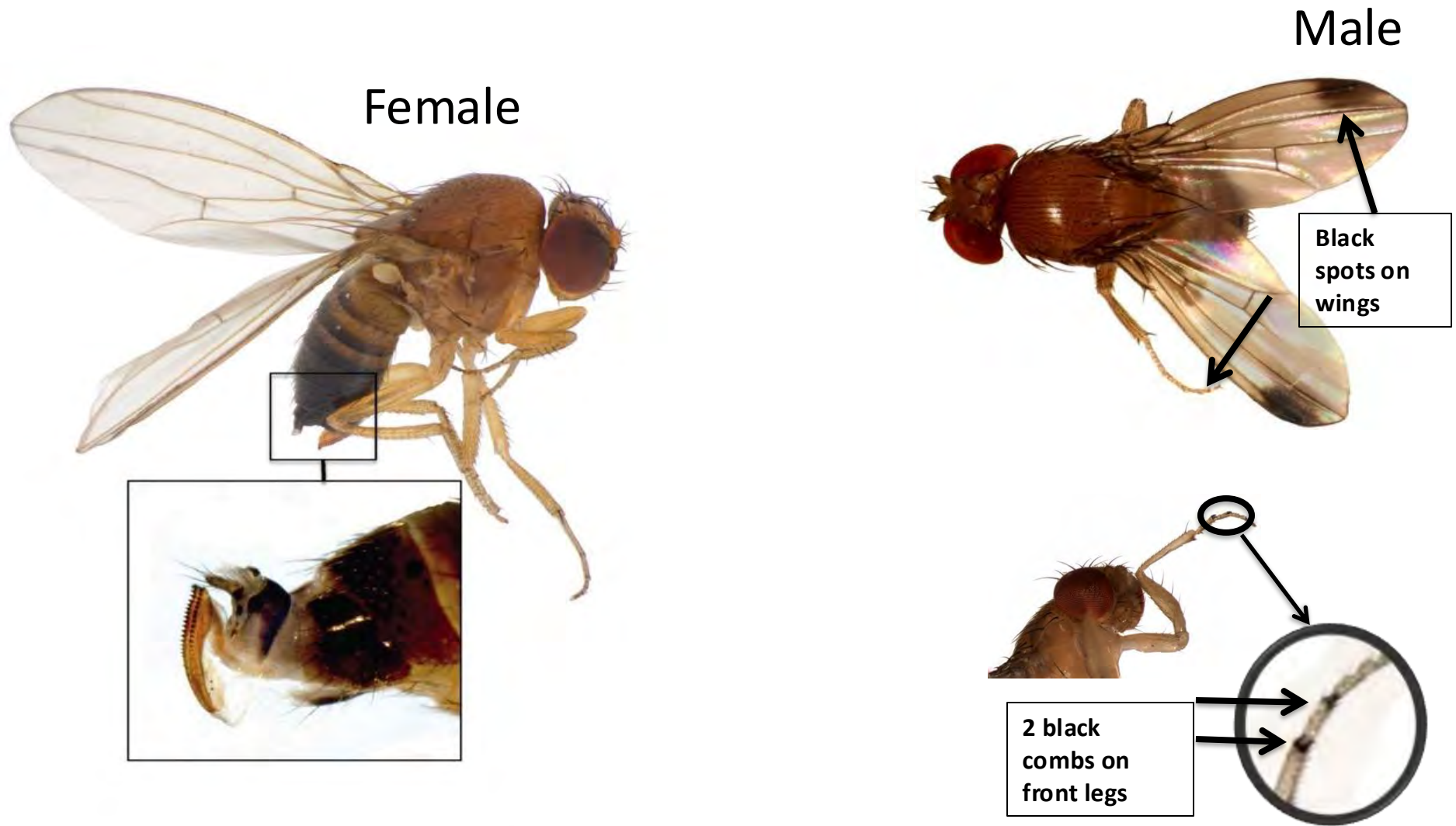
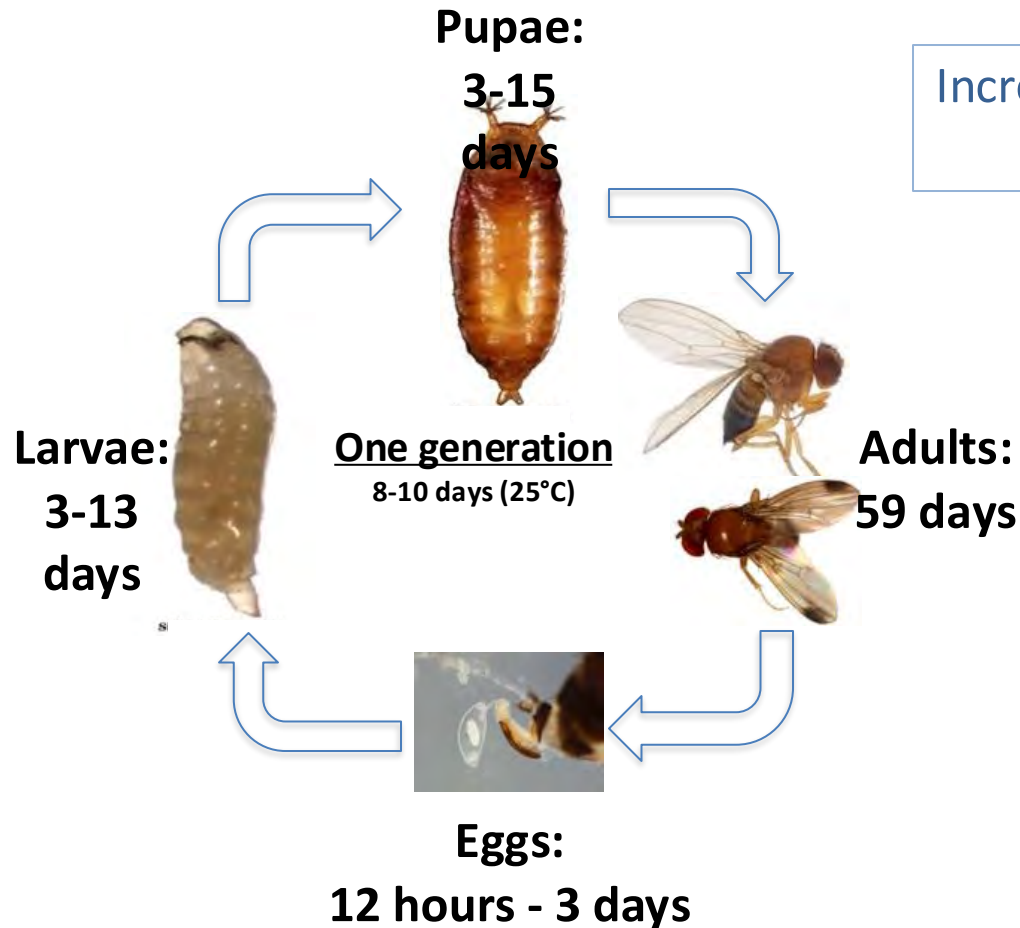


Figure 2. SWD Female and serrated ovipositor

# Spotted-Wing Drosophila (SWD)



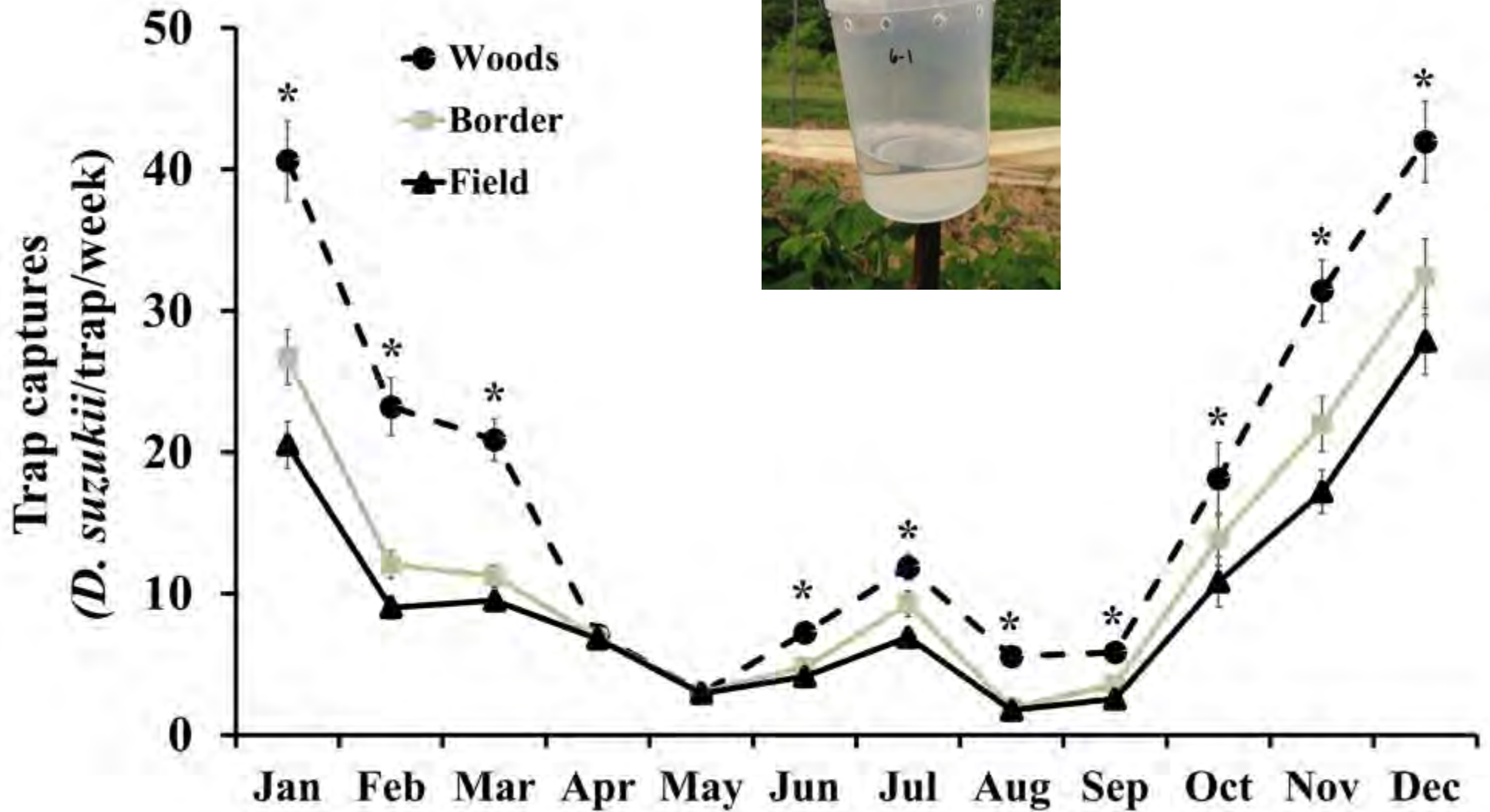
Increased Management Costs  
\$129 million

Annual Crop Losses  
\$718 million

Breathing tubes



# SWD Phenology



Average weekly adult SWD captures (Mean ± SEM) per trap at each of the three trapping locations across all sites





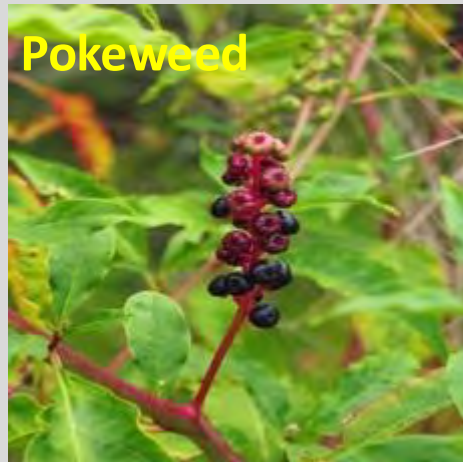
**Rubus spp.**



**Vaccinium spp.**



**American Beautyberry**



**Pokeweed**



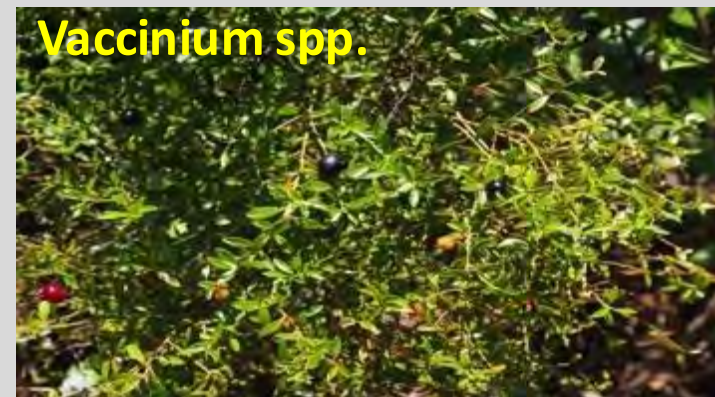
**Vaccinium spp.**



**Elderberry**

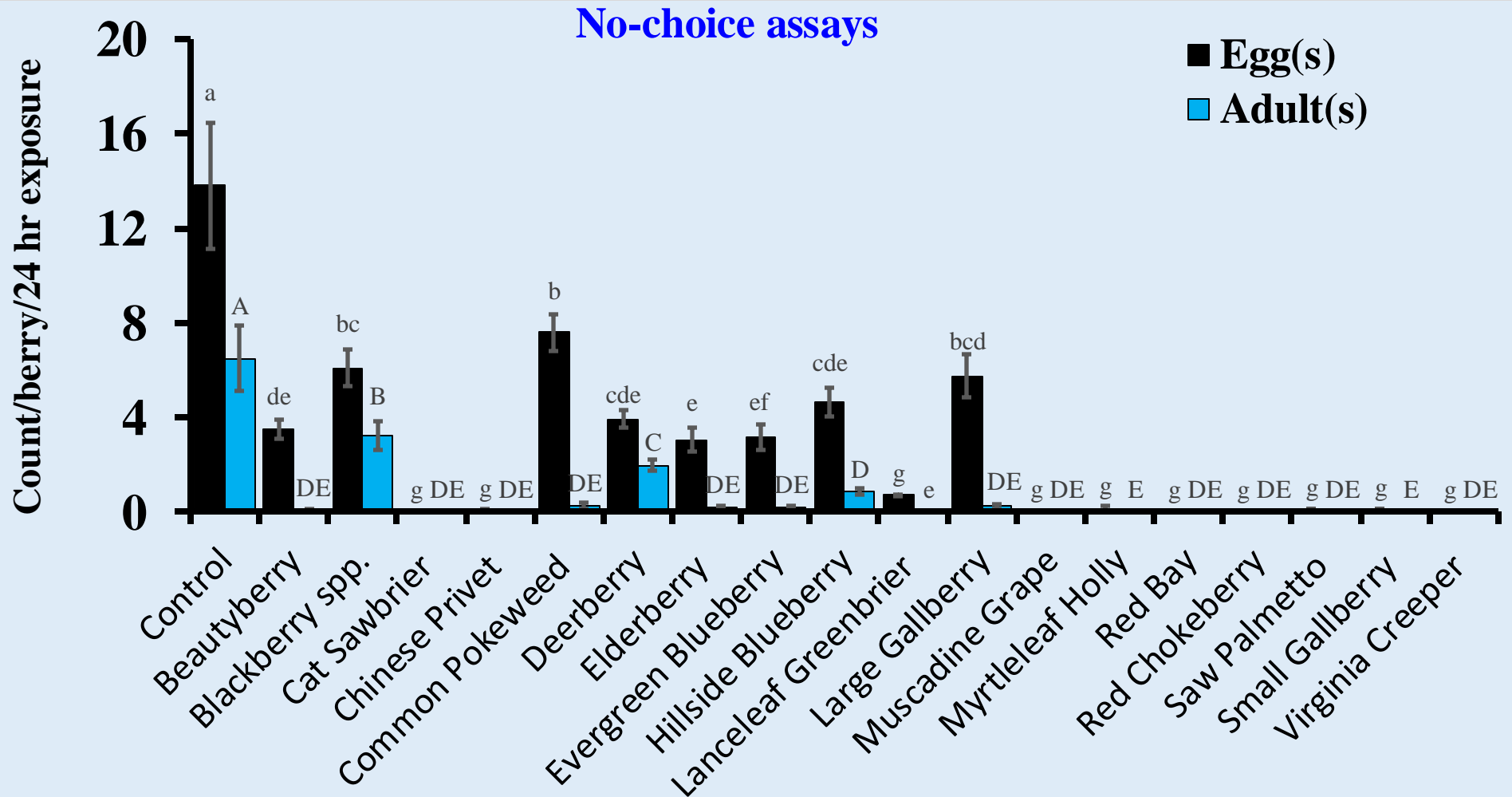


**Large Gallberry**



**Vaccinium spp.**

# Alternate Hosts



SWD oviposition and adult eclosion per berry (Mean ± SEM) in 2016

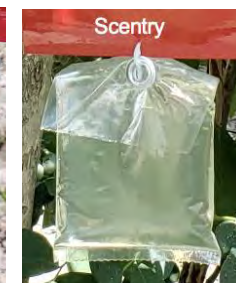






# Monitoring SWD: Wet vs Dry Traps

## SWD Standard Trap Test - 2011



(Panthi et al. 2022)



# Current SWD larval sampling methods in small fruits



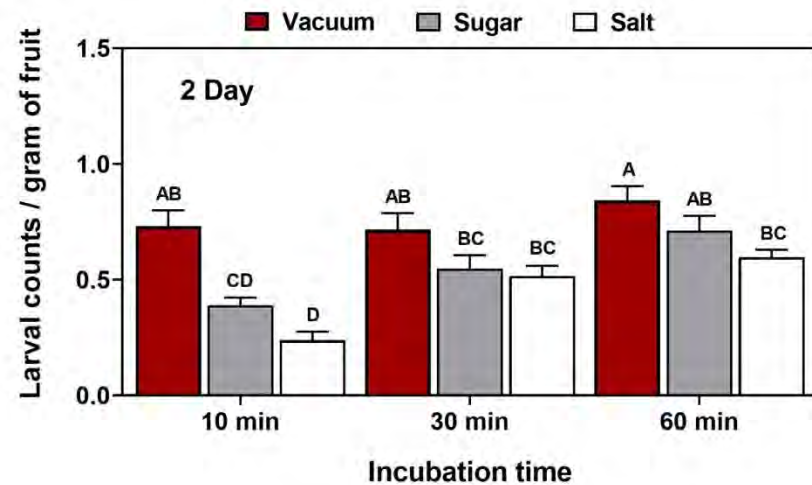
- ▶ **Salt extraction**
  - ▶ Lightly squeezing berries
  - ▶ 8.2% salt solution
- ▶ **Sugar extraction**
  - ▶ Lightly squeezing berries
  - ▶ 18% sugar solution
- ▶ **Freezing**
- ▶ **Dissection**



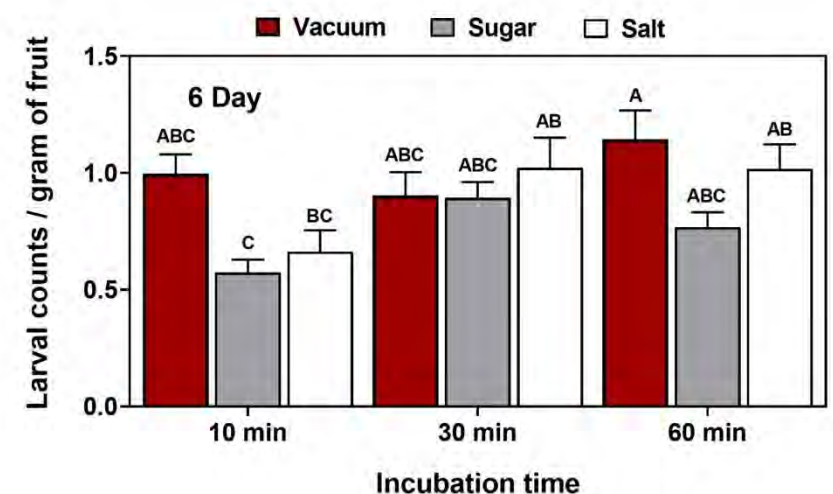
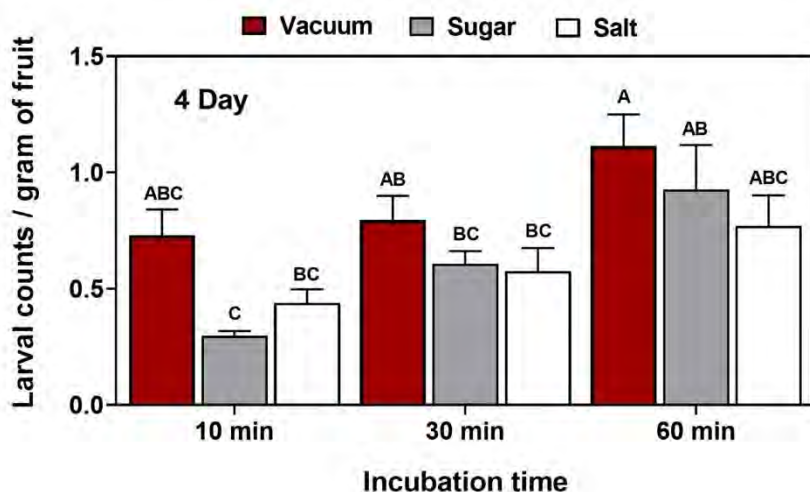
# Comparison of larval extraction methods



Vacuum extraction setup



- ▶ Larval extraction efficacy was highest at - 98 kPa for 60 minutes.
- ▶ The extraction efficacy ranges from 61- 83% of the total larval infestation.
- ▶ Blueberry sample volume (2-16 oz) does not interfere with the larval recovery.
- ▶ Compared with salt and sugar extraction, vacuum extraction was equally or more efficient in extracting the larvae.



# **SWD Management**

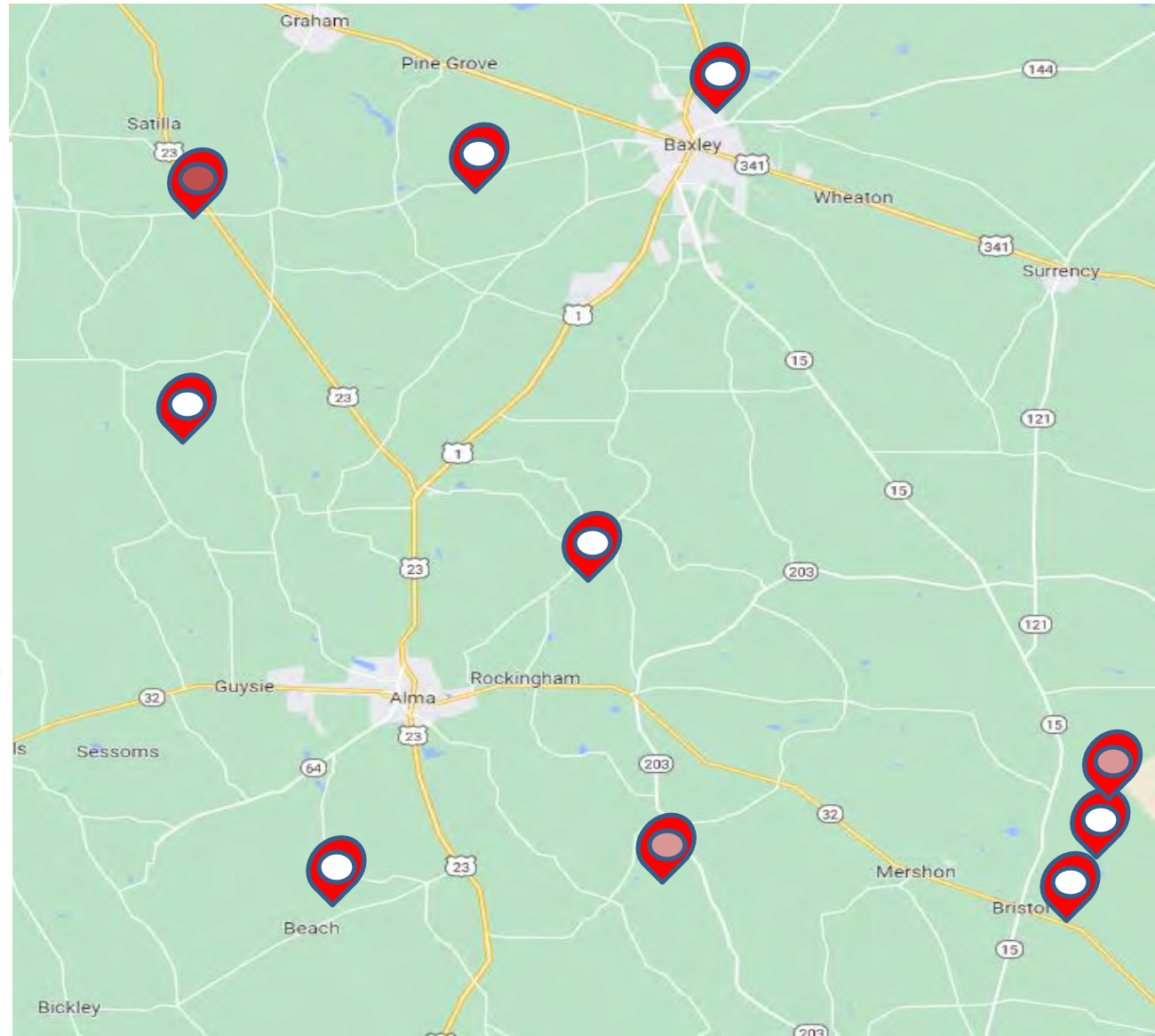
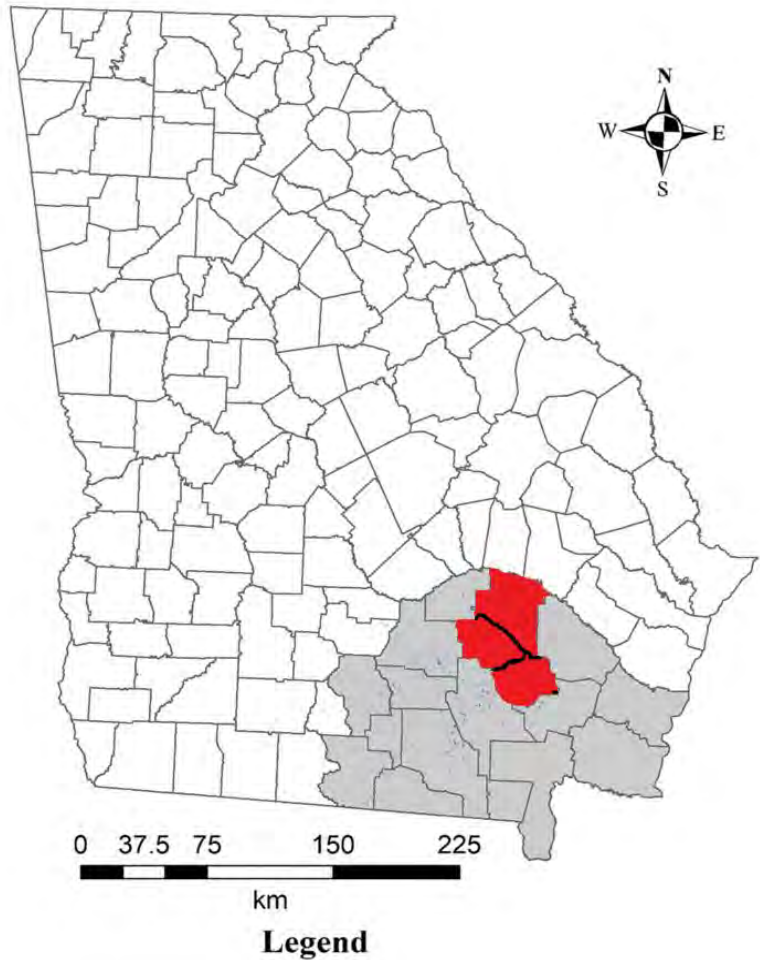
- **Biological control**
- **Chemical control**
- **Behavioral control**
- **Cultural control**



# Biological control



## Survey of resident parasitoids

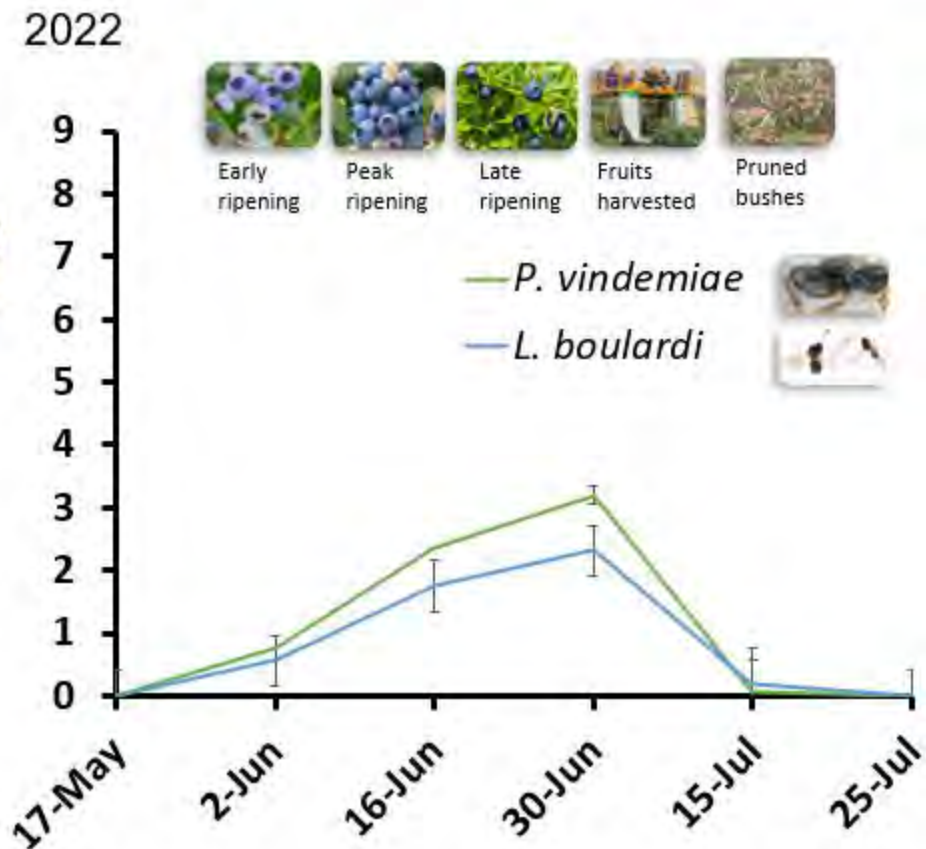
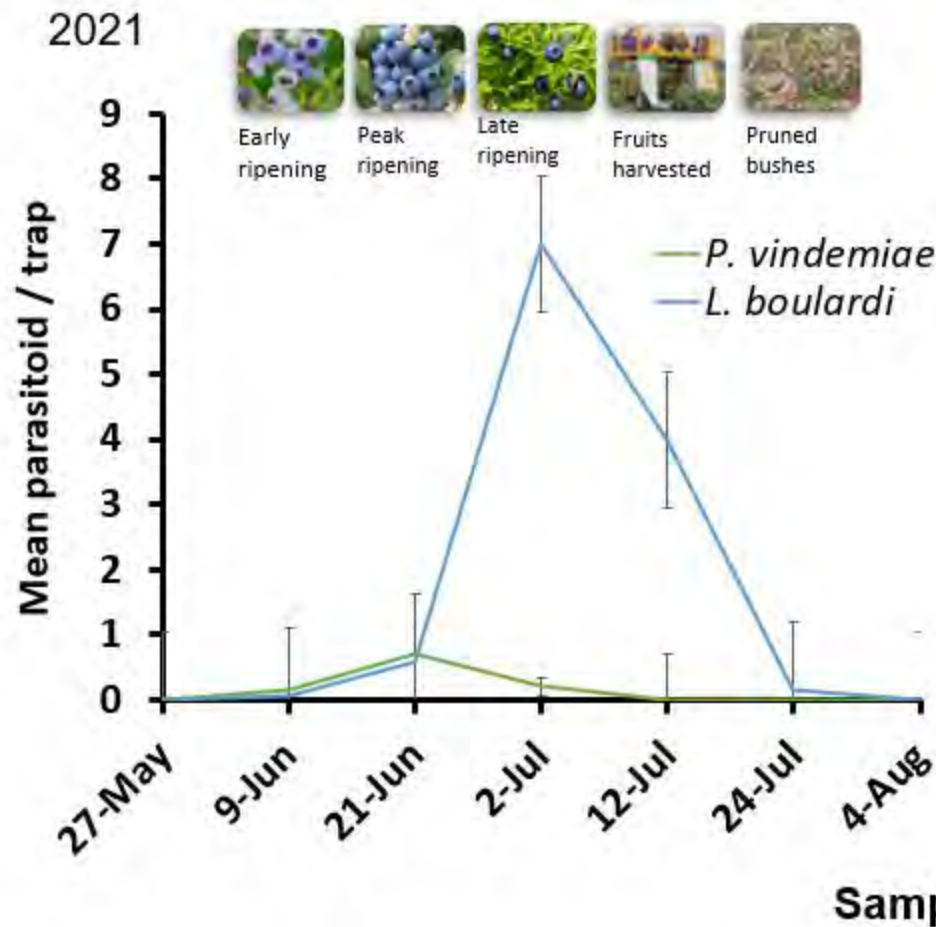




# Biological control



## Survey of resident parasitoids



# Biological control

Figitidae  
*Ganaspis*



Figitidae  
*Leptopilina*



## Classical Biological Control

USDA APHIS petition of *Ganaspis brasiliensis* (Gb) release in the USA is complete and releases should begin in 2022.

Permits have been developed for: California, Delaware, Florida, Georgia, Maine, Maryland, Michigan, New Jersey, North Carolina, Oregon, Virginia, Washington and West Virginia



United States Department of Agriculture  
Animal and Plant Health Inspection Service  
Plant Protection & Quarantine  
4700 River Road  
Riverdale, MD 20717

**Permit to Move Live Plant Pests, Noxious Weeds, and Soil**  
Intrastate Movement  
Regulated by 7 CFR 330

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PERMITTEE NAME(S):	University of California	PERMIT NUMBER:	P1926-111-03-01
ORGANIZATION:	University of California	APPLICATION NUMBER:	P1926-110523-0-01
ADDRESS:	5241 South Riverland Avenue Kerman, Agricultural Center Fowler, CA 93648	DATE ISSUED:	05/26/2011
		EXPIRES:	05/26/2013
MAILING ADDRESS:	5241 South Riverland Avenue Kerman, Agricultural Center Fowler, CA 93648	FACILITY NUMBER:	NA-8
		HAND CARRY:	Yes
PHONE:	519-508-5312		
ALT. PHONE:	519-264-5931		
EMAIL:	toland@ucop.edu, toland@ucop.edu		

DESTINATION: 9200 South Yorba Linda Avenue, Kearney Agricultural Center, Palmet, CA 92440  
RELEASE: multiple, multiple, CA multiple, (County: multiple)

Registered Article	Life Stage(s)	Intended Use	Shipment Origin	Originally Collected	Capture Designation
Genetic Data (all)	Adolescent	Research	USA	Originally Collected from Foreign Locations	Genetic Data

## PERMIT GUIDANCE

1) Important, iterative movement, and environmental release of the listed regulated organisms that have been genetically engineered may require a different permit issued under regulation 4.1 of CFR part 241. Any conditional important, iterative movement, or environmental release including conditional release of a regulated cell organism would be a violation of the regulation. Before moving genetically engineered organisms, contact APHIS Biotechnology Regulatory Services (BRS) at [brs@aphis.usda.gov](mailto:brs@aphis.usda.gov) or <http://aphis.usda.gov/biotechnology>. If BRS does not require a permit, contact the Pest, Pathogen, and Biocontrol permit unit for further guidance at [pest.permit@aphis.usda.gov](mailto:pest.permit@aphis.usda.gov). If an animal pathogen is identified in your shipment, to ensure appropriate safeguarding, please refer to [http://www.aphis.usda.gov/import\\_export/animal\\_health/animal\\_health\\_insects/animal\\_health\\_insects.html](http://www.aphis.usda.gov/import_export/animal_health/animal_health_insects/animal_health_insects.html).

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE FOLLOWING TWO HEADQUARTER OFFICIALS VIA E-PRINTS:

Robert Thompson

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09/22/2023

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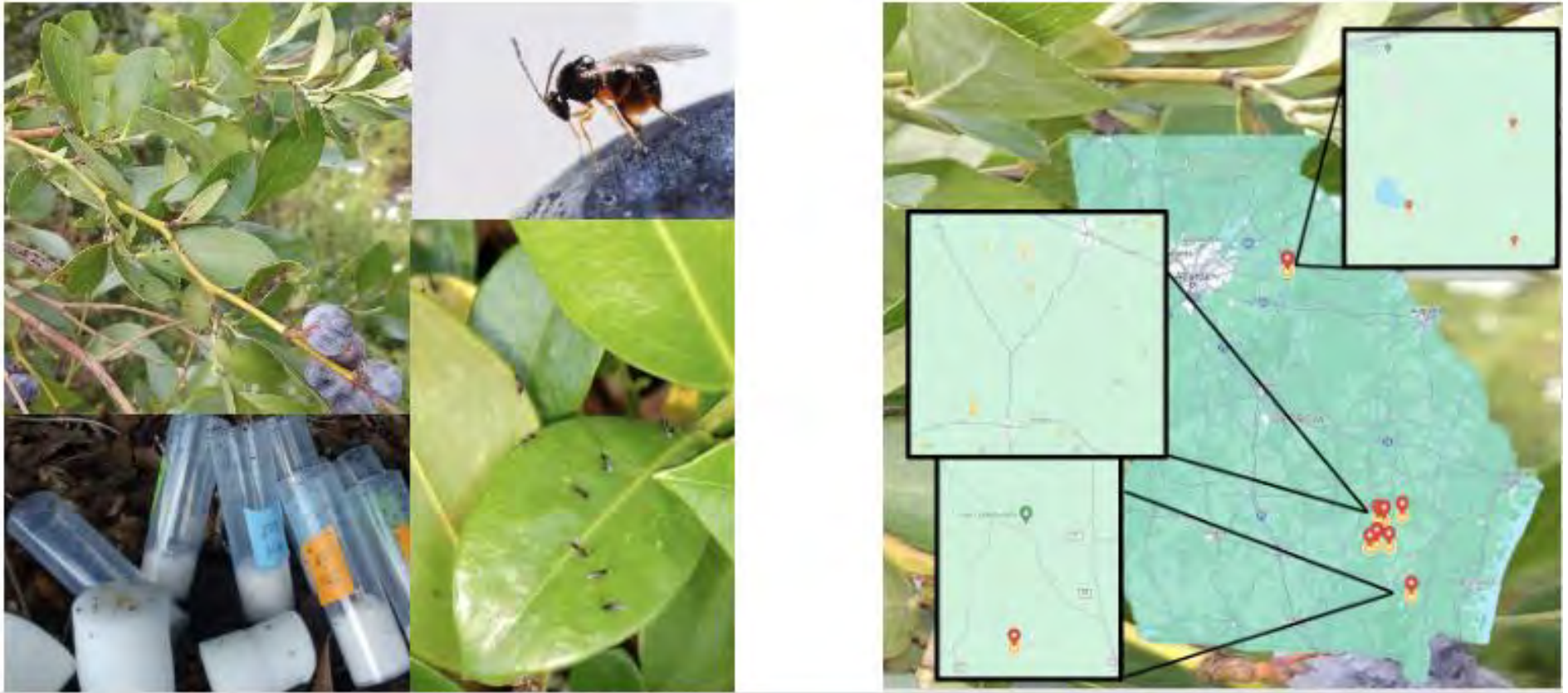


# Biological control



## Release of exotic parasitoid – *Ganaspis kimorum*

Wasps have been released at several locations. To determine establishment at the release sites, we plan to use sentinel traps or fruit samples.



**How can you help?**

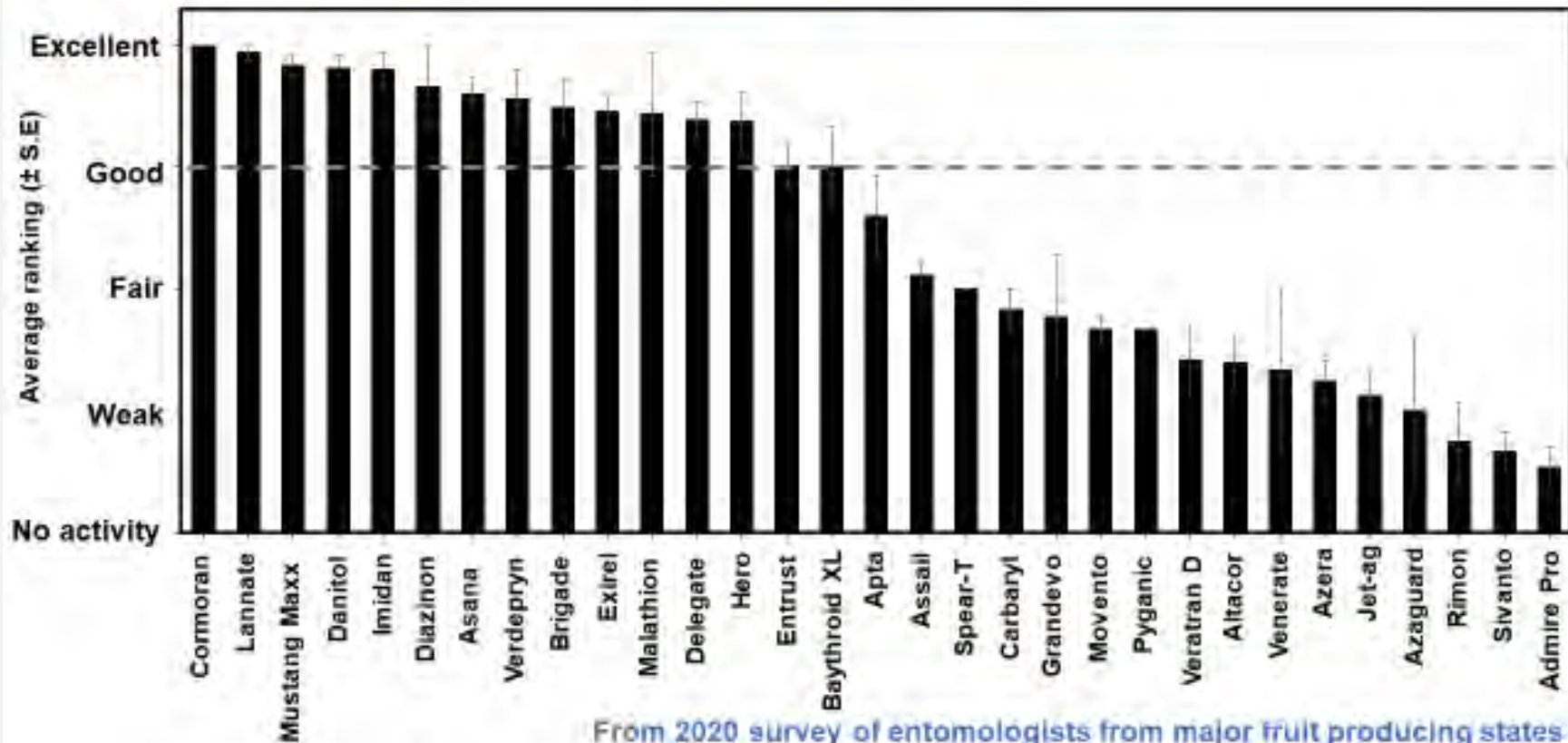
# Chemical control

2020 summary rankings of insecticide efficacy against SWD

9 states, 19 state x crop combinations

CA, OR, WA, MI, ME, NY, NJ, NC, GA, FL

## Insecticide efficacy rankings for SWD control



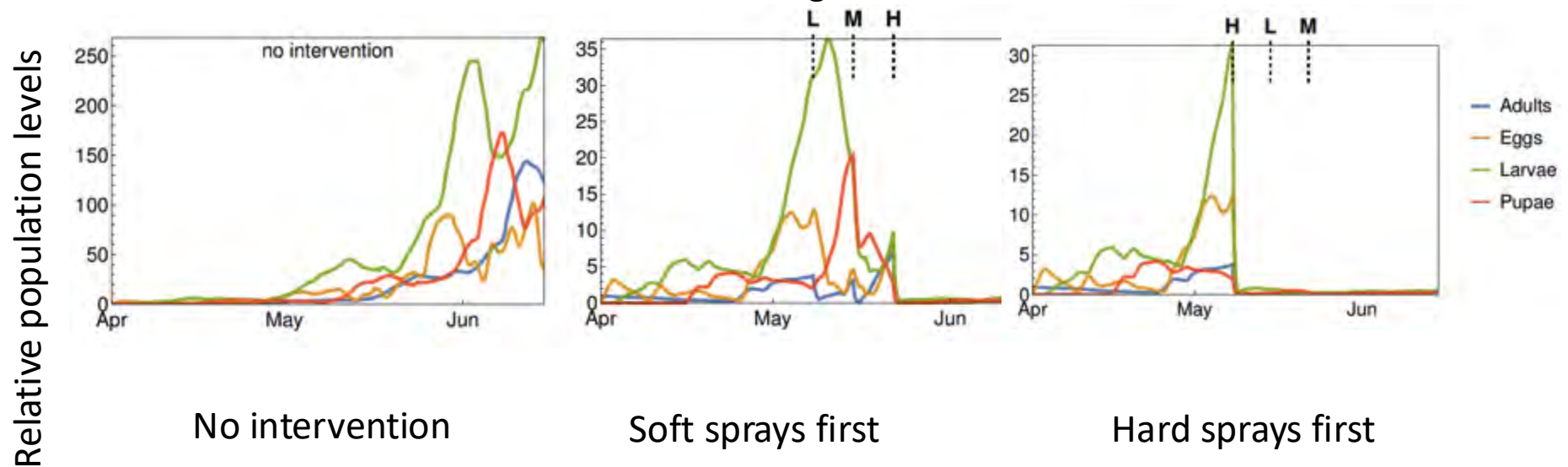


# Season-long Management Programs

Management Strategy	Weekly rotations
Export-friendly, maximum modes of action	Imidan, Malathion, Delegate, and Danitol
Short preharvest interval (PHI)	Mustang Maxx and Malathion
Reduced risk	Delegate, Exirel, Verdepryn
Organic	Entrust, Grandevo, Pyganic, and Venerate

# Population models and optimizing chemical control (led by Vaughn Walton Program)

Mortalities: Low= 12, Mid = 64, High = 98



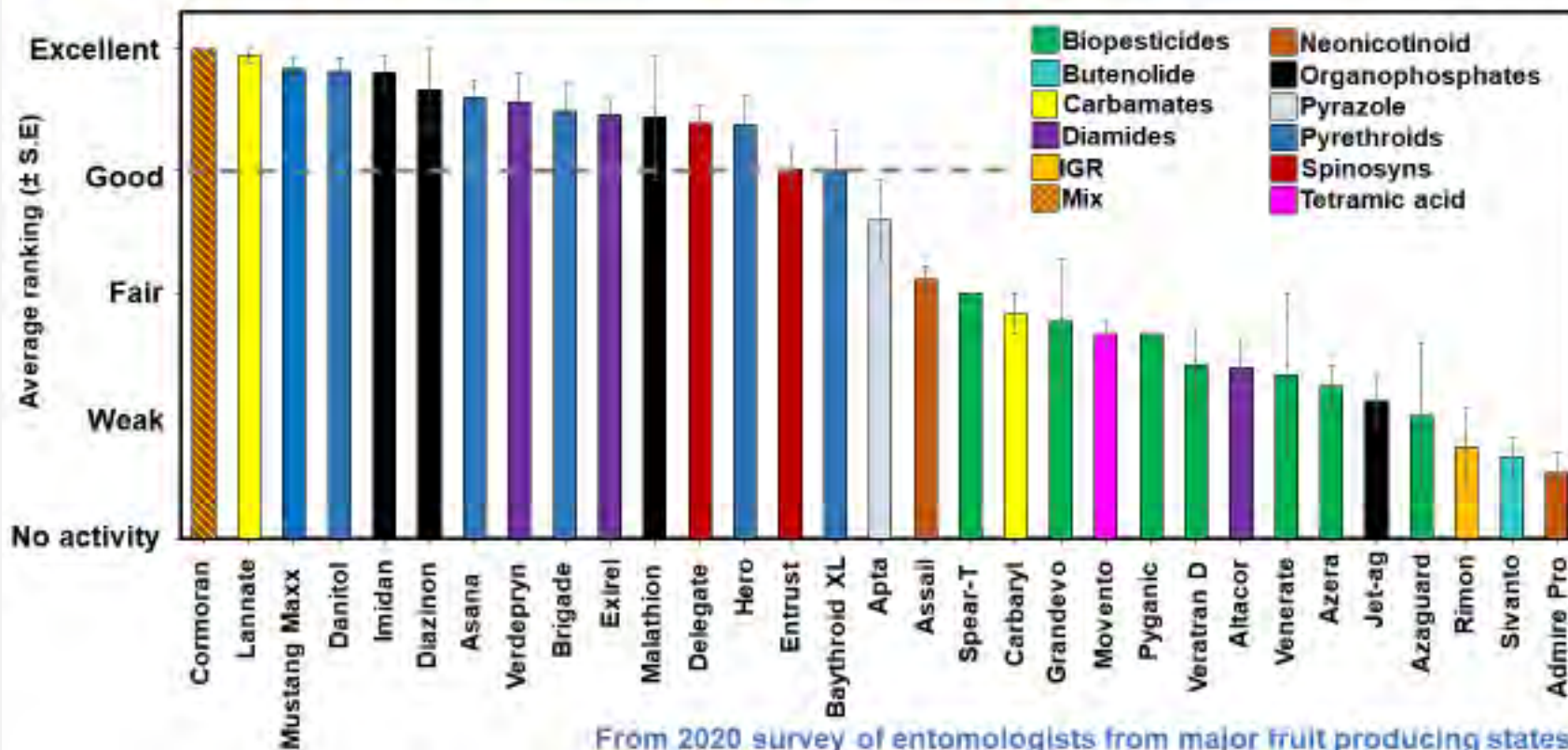
Hard sprays applied early in the season will result in lower population levels

Mermer et al. 2020. Impact of timing of insecticide sprays on *D. suzukii* life stage and populations

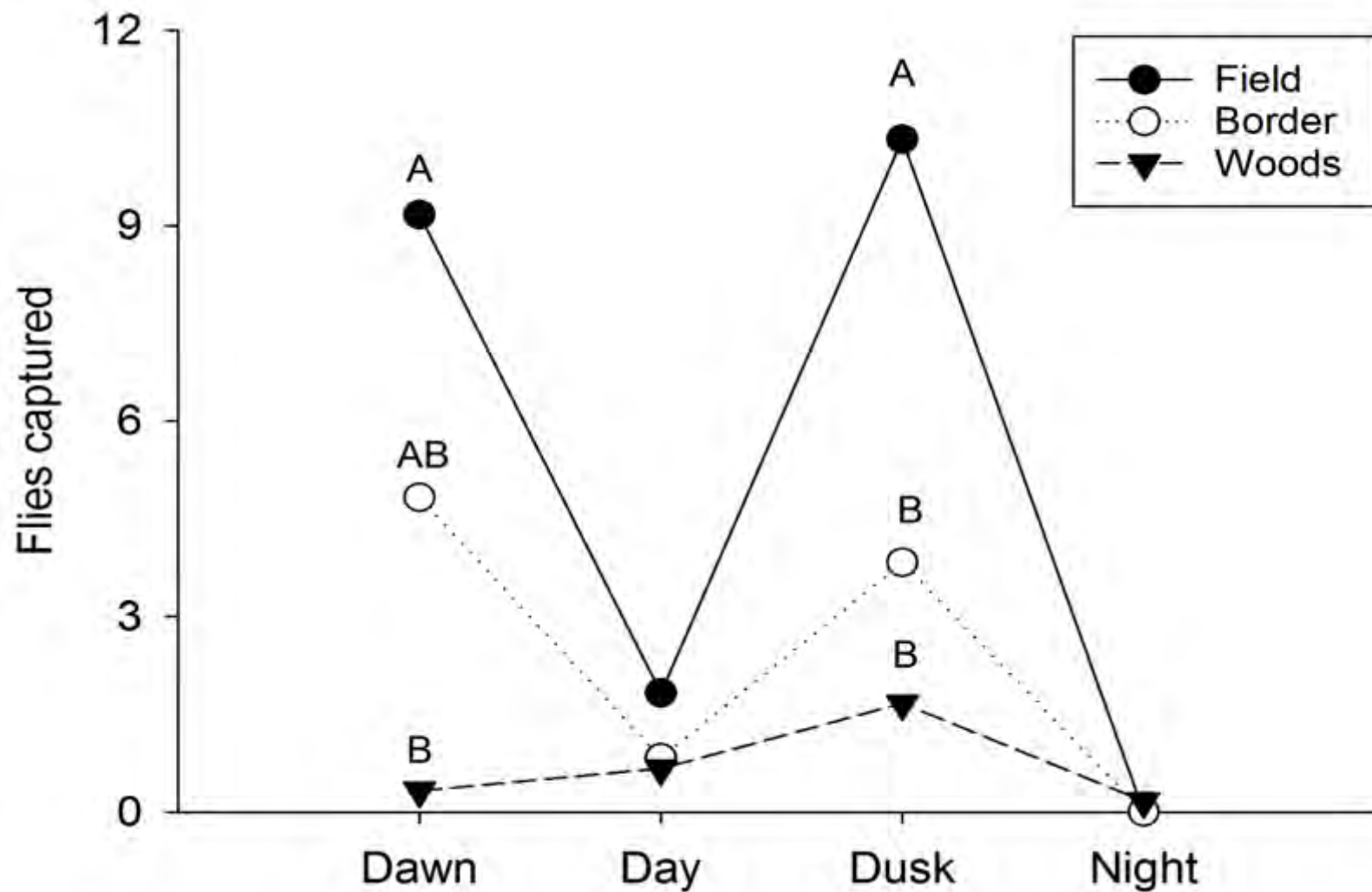
# 2020 summary rankings of insecticide efficacy against SWD

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## Insecticide efficacy rankings for SWD control

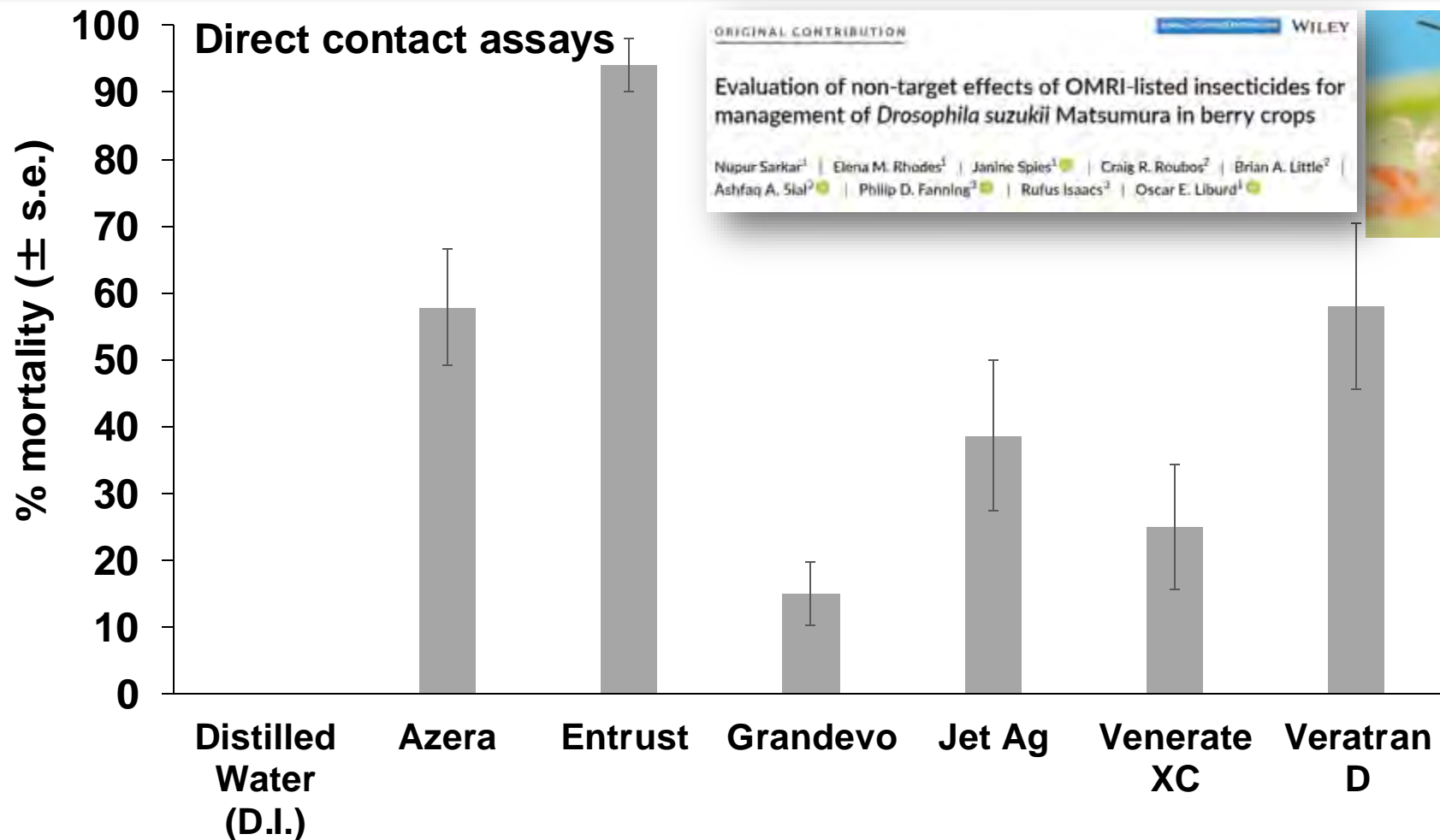


# SWD Activity in the Field





# Toxicity of insecticides to beneficial insects?



# Season-long Management Programs

1) FMP: Farmer's Management Program

2) BMP: Best Management Program



Treatment Program		2017	2018	2019
UTC		15.11 ± 3.74 a	13.75 ± 3.27 a	14.29 ± 3.75 a
BMP	With Nu Film P	76.67 ± 4.12 b	77.50 ± 8.85 b	52.37 ± 9.65 b
	Without Nu Film P	80.56 ± 3.74 b	85.00 ± 5.97 bc	
FMP	With Nu Film P	82.47 ± 3.95 b	100.00 ± 0.00 c	62.88 ± 11.53 b
	Without Nu Film P	86.11 ± 3.70 b	91.66 ± 8.33 bc	
Program: <u>df</u> , F, <i>p</i>		2:185, 89.39, <.0001	2:92, 143.334, <.0001	2:48, 9.932, 0.0002
Nu Film P: <u>df</u> , F, <i>p</i>		1:185, 0.147, 0.372	1:92, 0.003, 0.956	

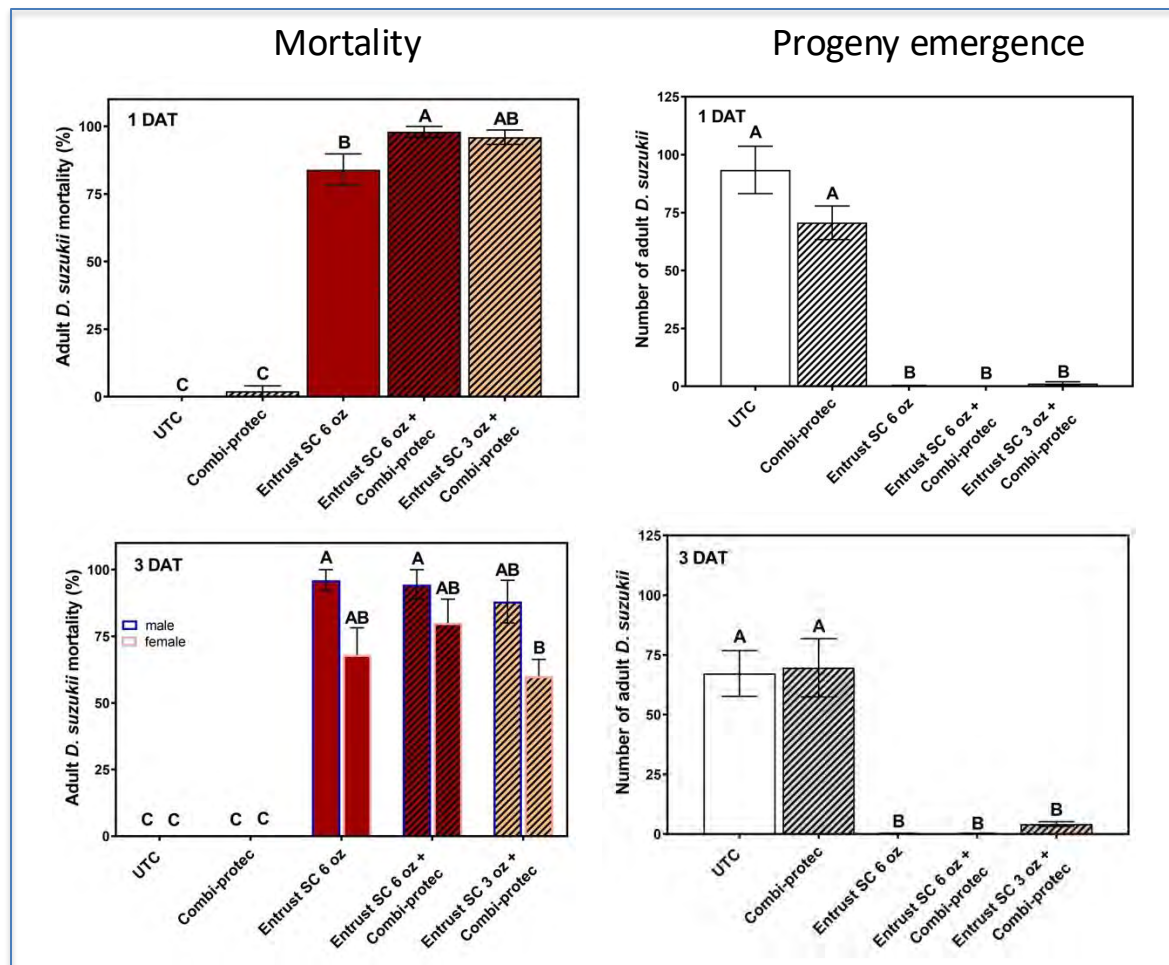
# Behavioral Control Strategies



## Combi-protec as a novel adjuvant for SWD chemical management

Semi-field bioassays were conducted to identify the efficacy of combi-protec as an adjuvant for SWD insecticide management.

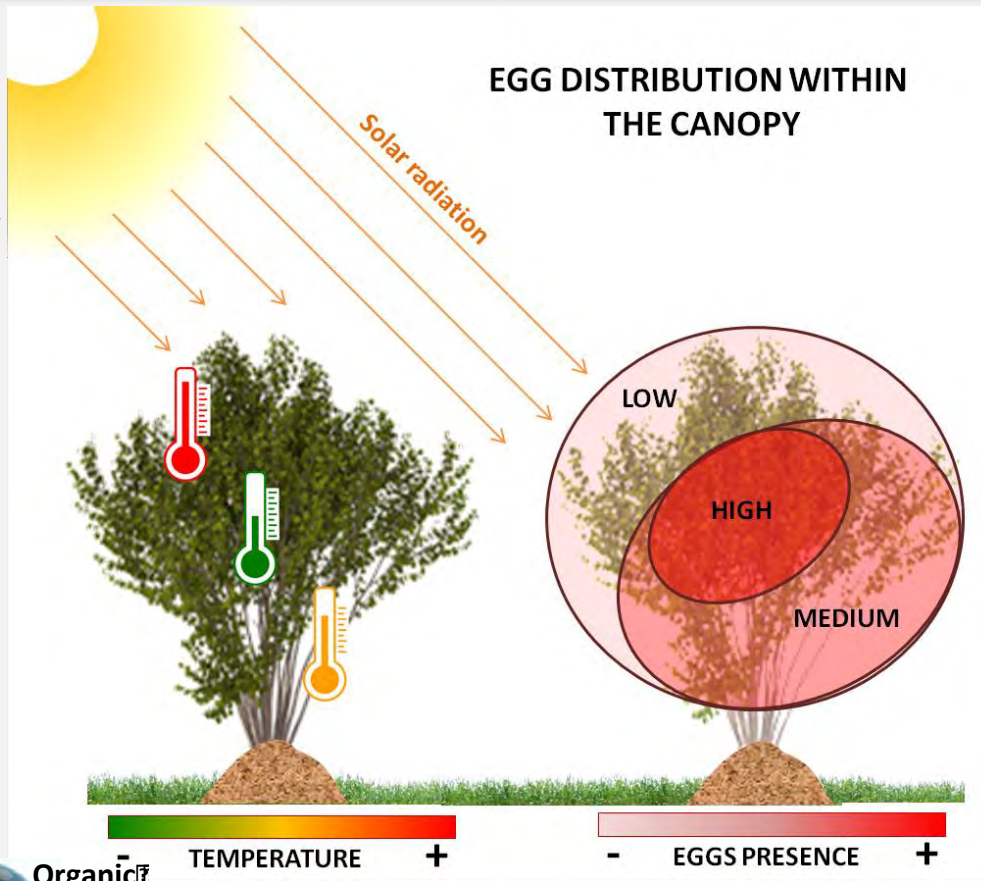
Compared with full dose Entrust alone application, when added with adjuvant combi-protec, reduction of insecticide dose by half in the treatment did not significantly decrease the insecticide performance



# Cultural Control Strategies

## Goal: Reduce Habitat Favorability

Illustration: Marco Rossi-Stacconi, © OSU



### TEMPERATURE

Don't survive at constant temp  $>87.6^{\circ}$  F; No egg laying at  $95^{\circ}$  F

### RELATIVE HUMIDITY

Lifespan and egg production increase with relative humidity; Do better  $>70\%$  RH

Rice et al. 2017 *J. Insect Behav.*; Diepenbrock and Burrack 2016 *J. Appl. Entomol.*; Rendon et al. 2019 *Pest Manag. Sci.*

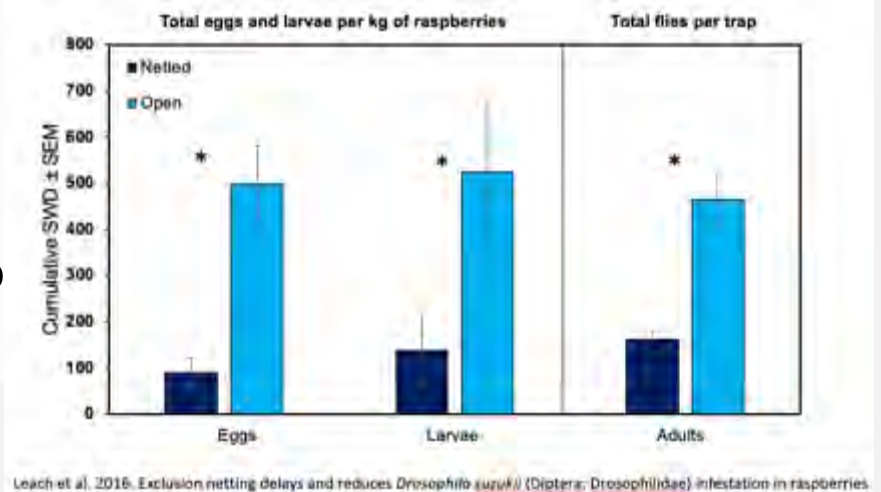
Organic  
SWD  
Management



# Physical Exclusion

**Exclusion trials:** AR, MI, MN, OR, NY

- If done right, mesh netting <1 mm works to exclude flies, reduce fruit infestation, and improve marketable fruit yield in raspberries and blackberries
- 100% control possible in blueberries
- If installed before fruit ripening/SWD susceptibility begins, will keep flies out of tunnels
- Tunnel grown fruit often higher quality
- May not be feasible for large farms due to high initial cost



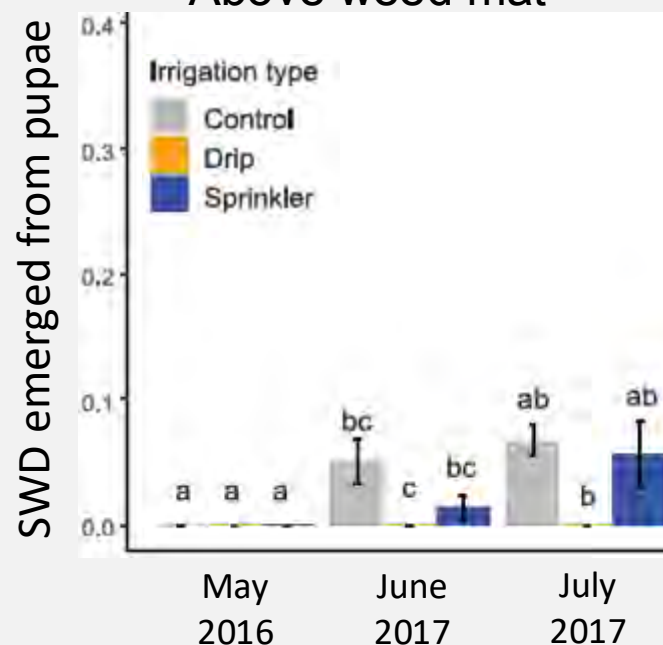
# Irrigation

Exclusion trials: OR

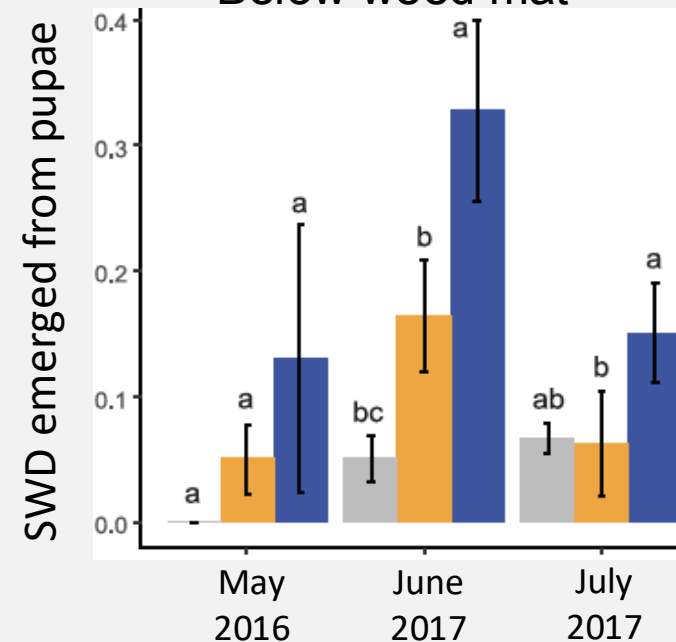


- Drip irrigation reduces relative humidity

Above weed mat



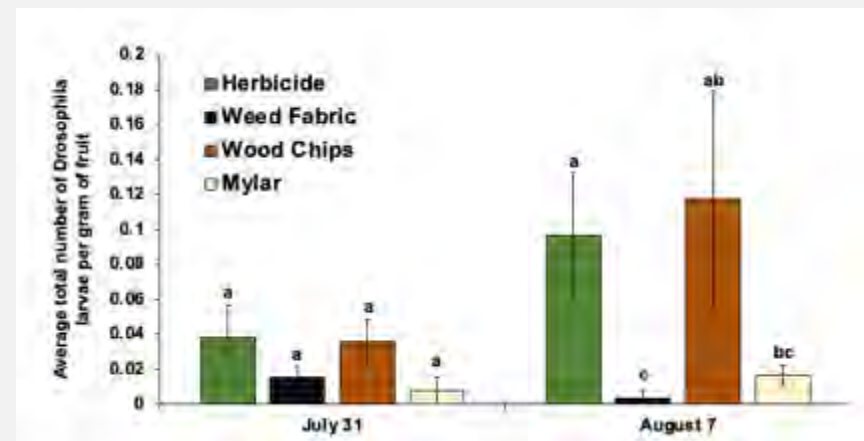
Below weed mat



Organic  
SWD  
Management

# Mulching

- **Mulching trials:** CA, GA, MD, MI, MN, OR
- **Mulches such as weed fabric and mylar that provide physical barrier:**
  - Prevent SWD larvae from entering the soil to pupate
  - Increased surface temperature in some studies
  - Decreased SWD survival above the mulch & fruit infestation



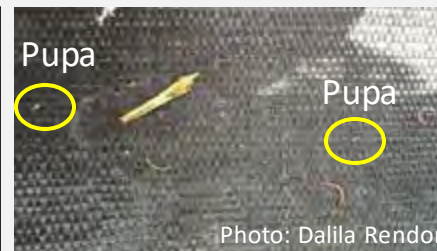
Pine Bark



Black Weed Mat



Silver Reflective



Rendon et al. 2019 *Pest Manag. Sci.*

Organic  
SWD  
Management



# Pruning

- Pruning trials: CA, GA, MD, MI, MN, OR
- Heavy pruning altered microclimate which affected habitat suitability for SWD
  - Increased temperature & light intensity, decreased RH in canopy
  - Decreased oviposition and fruit infestation
  - May decrease marketable yield in some systems
  - May improve spray coverage and harvest efficiency



Light Pruning



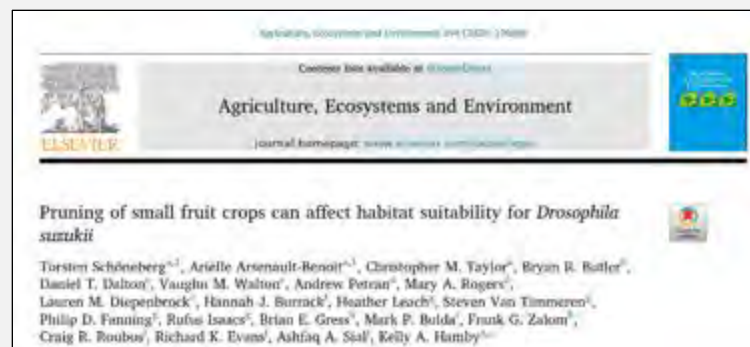
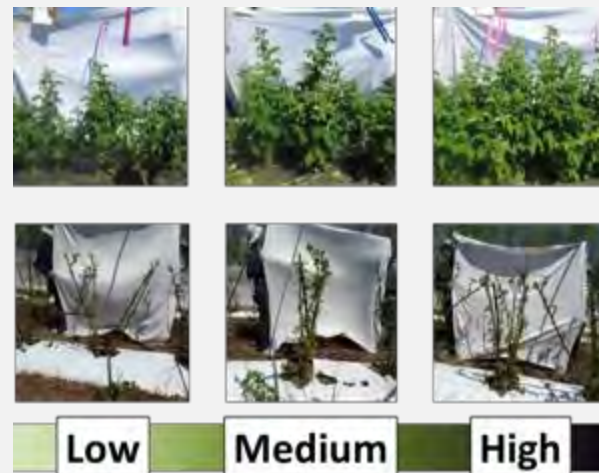
Medium Pruning



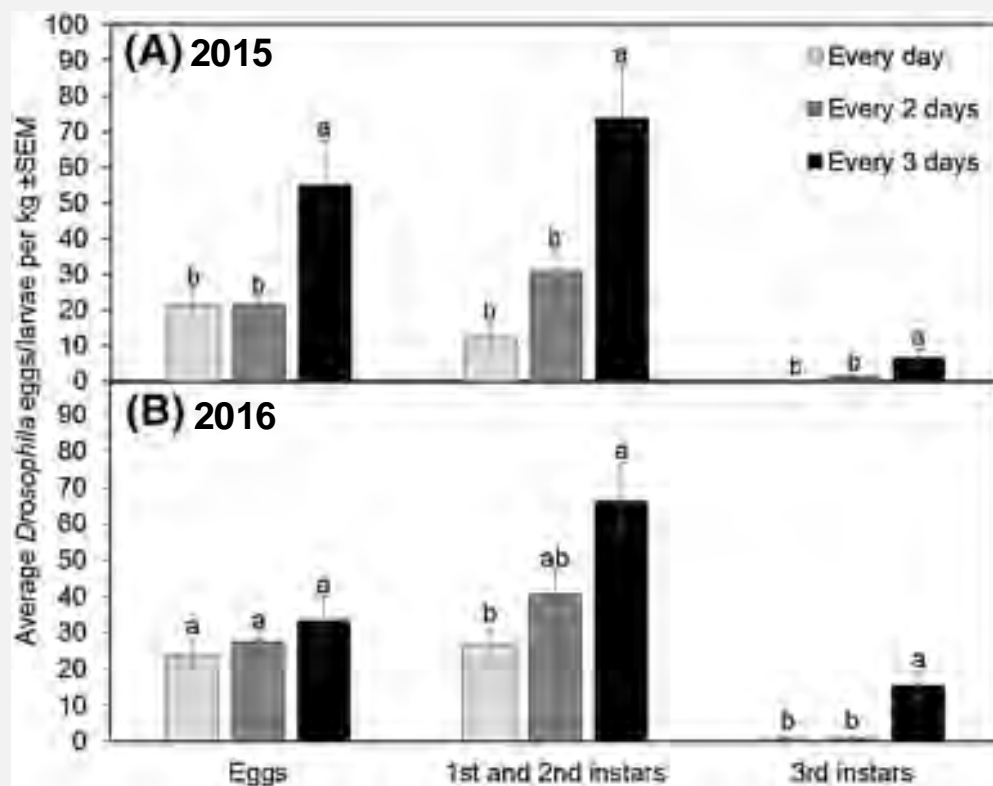
Heavy Pruning



## Canopy Density



# Harvest Frequency



- Removes resources for SWD from the farm
- Highest marketable yield per unit effort with a 2-day harvest interval

# Sanitation



- Remove and destroy cull fruit
- Leave in a sealed container
- 2-3 days in direct sun
- Bury  $\geq 2$  ft deep



# Postharvest Cold Storage



$0^{\circ}\text{C} = 32^{\circ}\text{F}$   
 $2.2^{\circ}\text{C} = 36^{\circ}\text{F}$   
 $20^{\circ}\text{C} = 68^{\circ}\text{F}$

Organic  
SWD  
Management

Kraft, et al. 2020. *J. Econ. Entomol.*

# SUMMARY

## Seasonal 'at a glance' insecticidal spray schedule options for blueberry

Developmental Stage	Dormant (before flower or leaf bud break)	Pre-Bloom through Green Tip (leaf buds) and Pink Bud (flower buds)	10-20% Bloom until 80-90% Bloom	Petal Fall until one month after Bloom	Cover Sprays (One month after Bloom until Pre-Harvest	Pre-Harvest through Harvest	Late Season and After Harvest
<b>Insect Pests</b> (Insecticides/ Management options)	<p><b>Bagworms</b> (Remove and dispose of canes)</p> <p><b>Scale Insects</b> (Horticultural/ Superior oil, Assail, Admire Pro, Sivanto, Knack, Movento)</p> <p><b>Red imported fire ants</b> (Esteem Ant Bait, Extinguish Professional Fire Ant Bait)</p> <p><b>Gall midge</b> (Assail, Delegate, Entrust, Diazinon)</p>	<p><b>Gall Midge</b> (Assail, Delegate, Entrust, Diazinon)</p> <p><b>Flower Thrips</b> (Delegate, Entrust, Assail)</p>	<p><b>Flower Thrips</b> (Delegate, Entrust, Assail)</p>	<p><b>Cranberry and Cherry Fruitworms</b> (Altacor, Verdepryn, Avaunt, Intrepid, Rimon, Assail, Delegate, Entrust, Confirm, Grandevo, Pyganic, Venerate)</p> <p><b>Sharpnosed Glassy-winged Sharpshooter, and other Leafhoppers</b> (Assail, Admire Pro, Actara, Asana, Movento)</p> <p><b>Sharpnosed Glassy-winged Sharpshooter, and other Leafhoppers</b> (Assail, Admire Pro, Actara, Asana, Movento)</p> <p><b>Plum Curculio</b> (Imidan, Avaunt, Actara, Sniper, Altacor, Asana, Danitol, Surround)</p>	<p><b>Sharpnosed Glassy-winged Sharpshooter, and other Leafhoppers</b> (Assail, Admire Pro, Actara, Asana, Movento)</p> <p><b>Periodical Cicadas</b> (0.25-inch Mesh Netting)</p> <p><b>Flea Beetle</b> (Sevin, Assail, Admire Pro, Actara, Entrust, Delegate)</p> <p><b>Japanese Beetle</b> (Imidan, Admire Pro, Assail, Sevin, Asana, Neemix + Trilogy)</p>	<p><b>Blueberry Stem Borer</b> (Prune &amp; destroy all infested and wilted canes)</p> <p><b>Blueberry Maggot</b> (Brigade, Sniper, Imidan, Assail, Admire Pro, Delegate, Verdepryn, Malathion, Movento, Danitol, Mustang Maxx)</p> <p><b>Spotted-wing Drosophila</b> (Imidan, Danitol, Brigade, Sniper, Mustang Maxx, Delegate, Lannate, Exirel, Verdepryn, Malathion, Cormoran, Entrust, Spear-T, Grandevo, Pyganic, Venerate, Jet-Ag)</p> <p><b>Yellownecked Caterpillar, Spanworms, Azalea Caterpillar, Red Humped Caterpillar</b> (Dipel DF, Altacor, Asana, Adjourn)</p>	<p><b>Sharpnosed Glassy-winged sharpshooter, and other leafhoppers</b> (Assail, Admire Pro, Actara, Asana, Movento)</p> <p><b>Blueberry Bud Mite</b> (Variety selection, summer hedging, Horticultural/ Superior oil, Portal)</p> <p><b>Chilli Thrips</b> (Assail, Delegate, Admire Pro, Entrust, Sivanto Prime, Movento)</p> <p><b>Scale Insects</b> (Horticultural/ Superior oil, Assail, Admire Pro, Sivanto, Knack, Movento)</p>

# SUMMARY

- ✓ SWD remains to be the key pest. Adult SWD flies can be trapped year-round.
- ✓ Red panel traps baited with commercial lures are just as effective as liquid traps
- ✓ Wooded areas seem to serve as population reservoirs. A number of wild plant species present in wooded areas can serve as hosts of SWD
- ✓ A number of conventional insecticides are effective against SWD but repeated application may result in insecticide resistance and secondary pests.
  - ✓ Make sure to rotate insecticides with different MOA
  - ✓ Use more reduced risk insecticides to minimize nontarget effects
  - ✓ Make spray applications during dawn and dusk to improve insecticide efficacy



# SUMMARY

- ✓ Organic management remains a challenge. A combination of organic insecticide applications and cultural strategies may be needed for effective control
- ✓ Bud mites, spider mites, scales, gall midge and flower thrips are the most important secondary pest issues
  - ✓ Frequent sampling is necessary to determine infestation levels and make control applications
  - ✓ A number of insecticides including JMS Stylet Oil, Damoil, and other oils are effective against budmites and scales
  - ✓ Other insecticides including delegate, Assail, and the new products – Sivanto, Centaur, Movento are effective against most of the secondary pests
  - ✓ Spray timing and coverage are key to good control

<http://www.smallfruits.org>

2024

# Southeast Regional Blueberry INTEGRATED PEST MANAGEMENT GUIDE

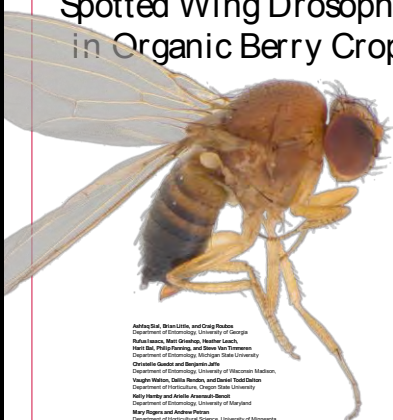


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## MANAGEMENT RECOMMENDATIONS FOR Spotted Wing Drosophila in Organic Berry Crops



Anthony S. Brankin, and Craig R. Rieck  
Department of Entomology, University of Georgia  
Ruth H. Hines, Matt G. Hines, Heather L. Lach,  
Matt S. Phillips, and Brian W. Tjallingii  
Department of Entomology, Michigan State University  
Christine G. Gahan and Benjamin J. Allen  
Department of Entomology, University of Wisconsin-Madison  
Vaughn R. Nelson, David R. Nelson, and Robert T. Nelson  
Department of Entomology, Oregon State University  
Molly T. Nelson and Andrew R. Nelson  
Department of Entomology, University of Maryland  
Mary T. Nelson and Andrew R. Nelson  
Department of Entomology, University of Minnesota  
Dean L. Nelson and Andrew R. Nelson  
Department of Entomology, University of Florida  
Dean L. Nelson  
Department of Entomology, University of Arkansas  
Paul D. Nelson and Brian G. Nelson  
Department of Entomology and Plant Pathology, University of California-Davis  
Nelson R. Nelson and James R. Nelson  
Department of Entomology and Plant Pathology, North Carolina State University  
John S. Nelson  
Tracy Nelson  
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