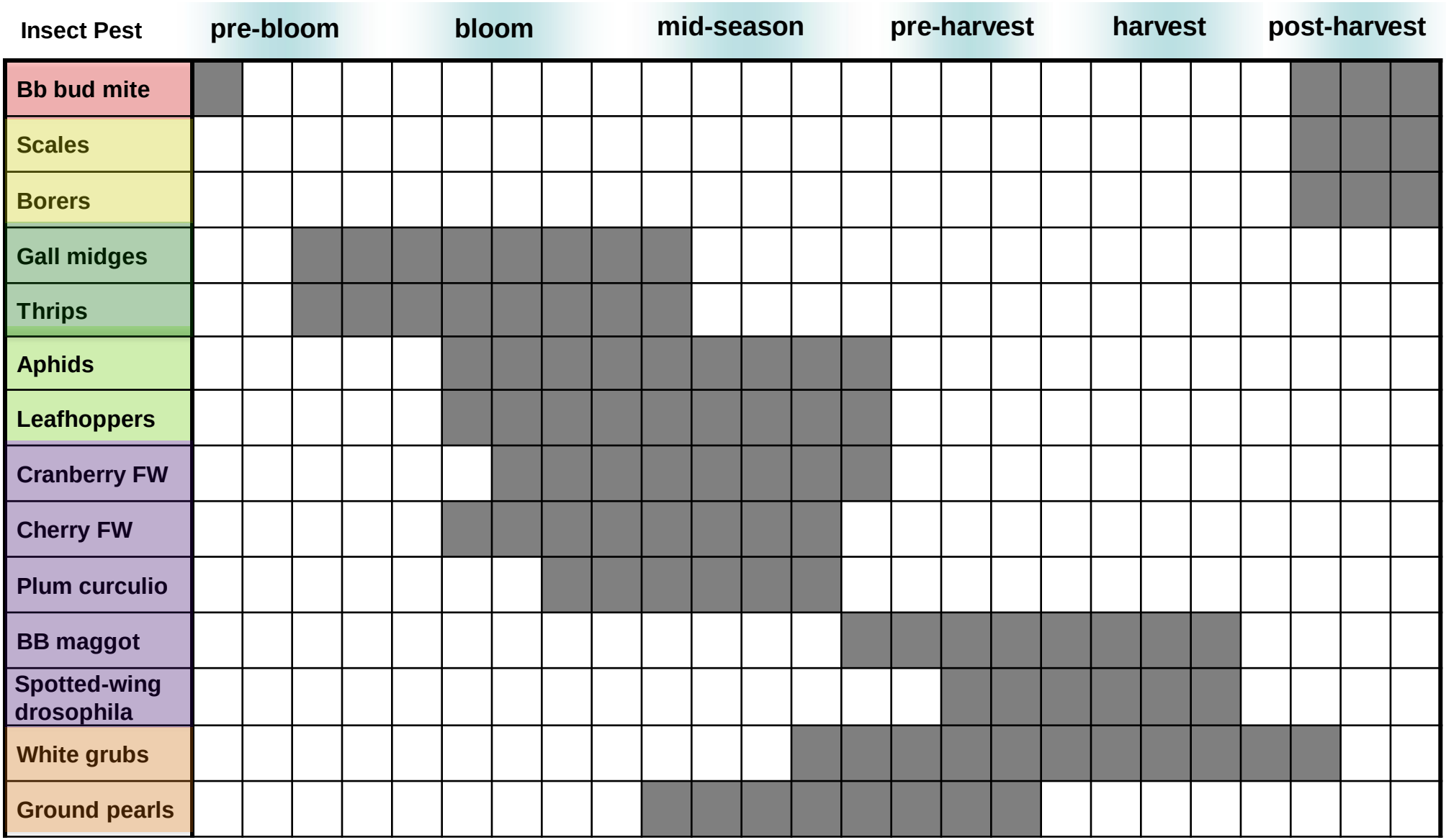
Blueberry Insect Update

Ash Sial
Department of Entomology
University of Georgia

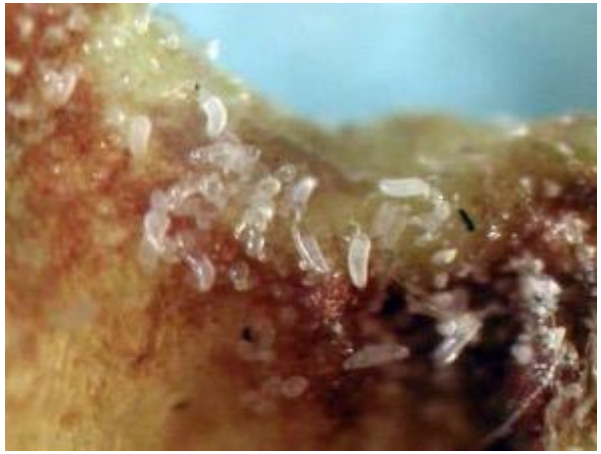
Economically-important activity periods of arthropod pests*



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

Blueberry Bud Mite

(*Acalitus vaccinii* Keifer)

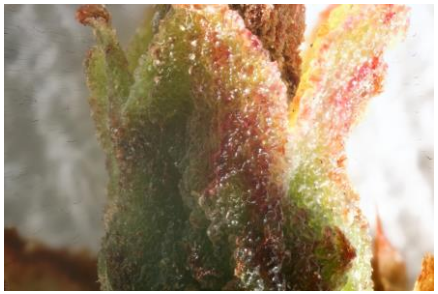


- **Eriophyid family of mites**
- **Transparent to whitish body, 1/128 inch long (approx. 200 micron)**
- **Females lay approx. 200 eggs**
- **Develop through 4 stages to complete lifecycle in 15 days at 19 ^{o}C**
- **Disperse primarily by air. May also disperse by crawling or hitch-hiking**
- **Populations 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**

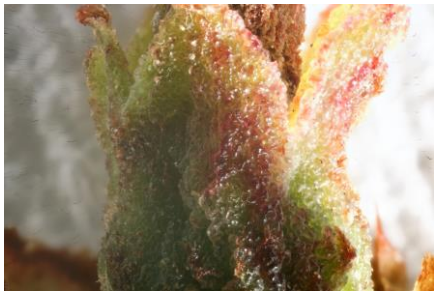


Blueberry Bud Mite

(*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

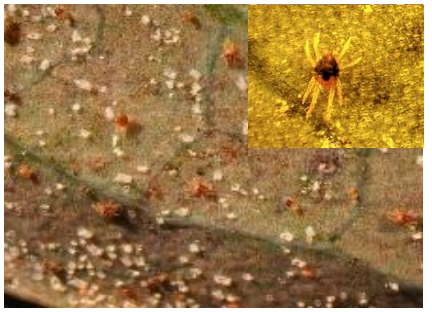
- **Postharvest pruning and removing of old canes will reduce bud mite population**
- Insecticides/miticides: **Portal, Oberon, Acramite, Brigade, Danitol, Sevin, Abamectin, Movento, horticultural/superior oils (2% by volume)**
- **Use high volume (100-300 gal/A), high pressure (200 psi) applications 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

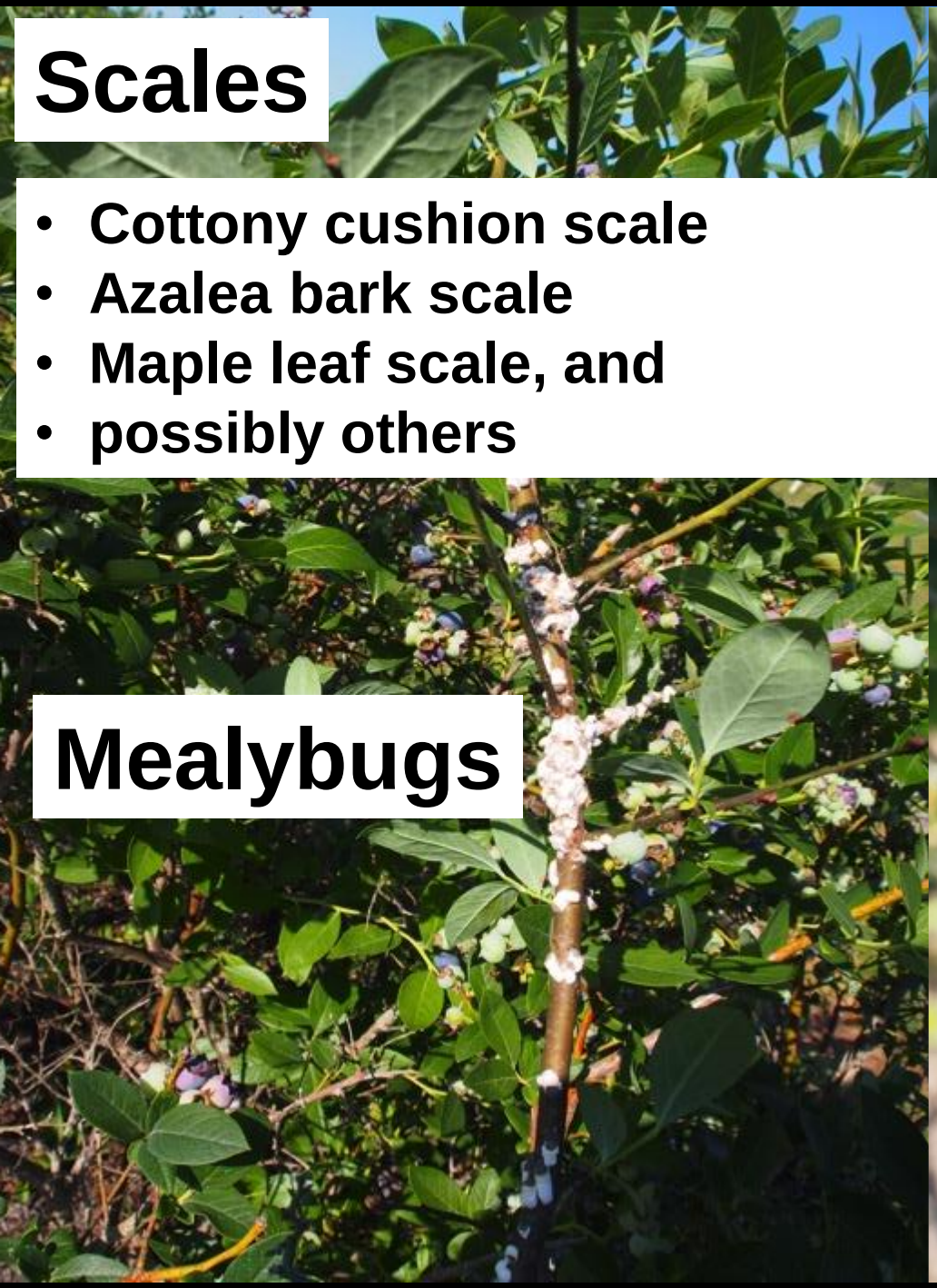
(*Oligonychus ilicis* McGregor)



- 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:

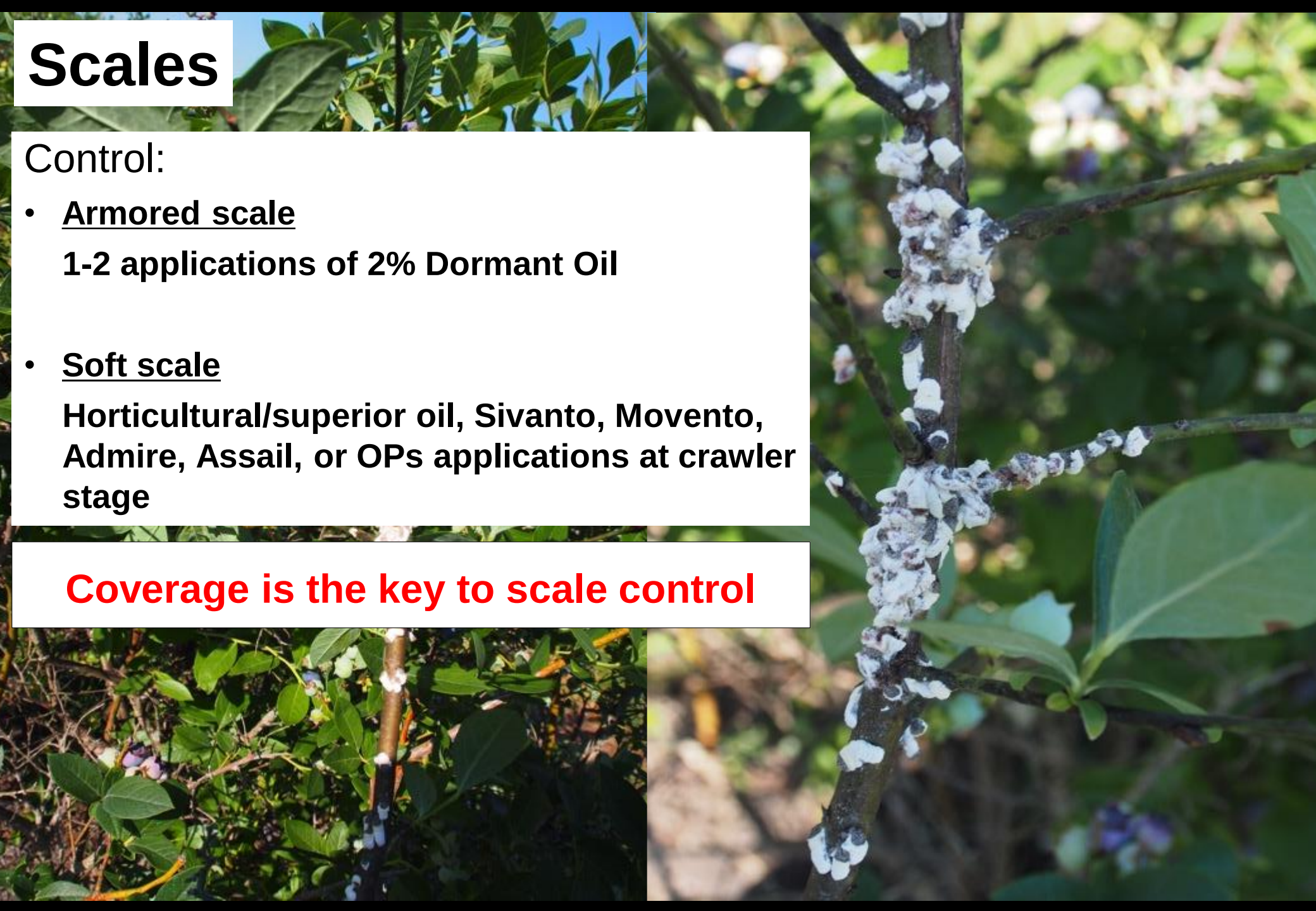
- **<u>Armored scale</u>**

  1-2 applications of 2% Dormant Oil

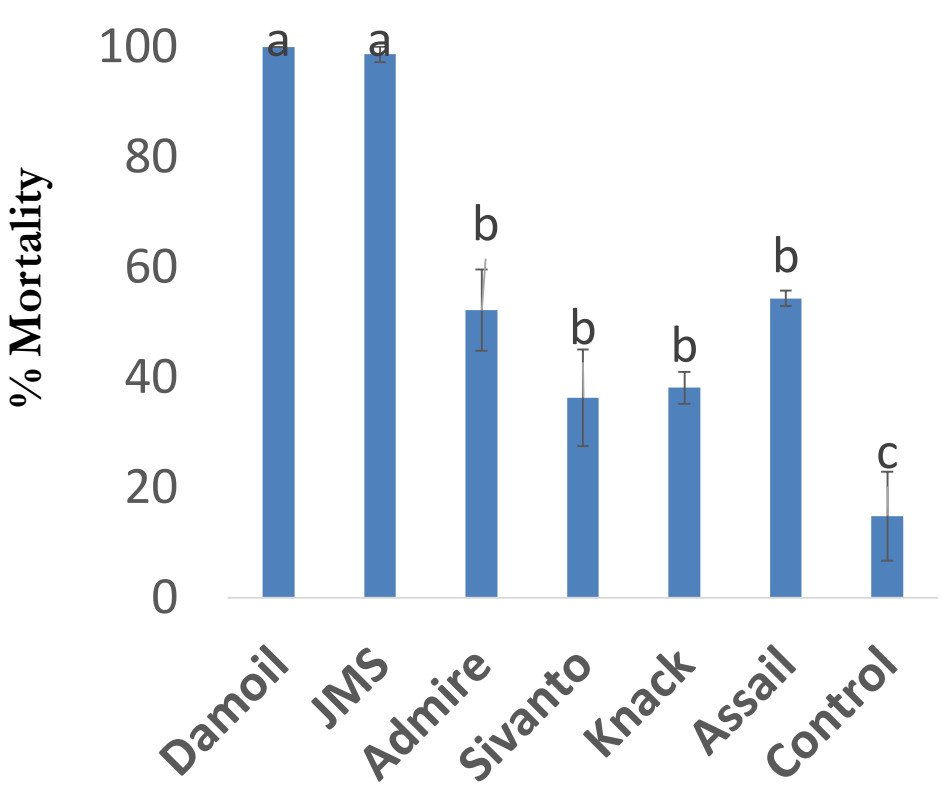
- **<u>Soft scale</u>**

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

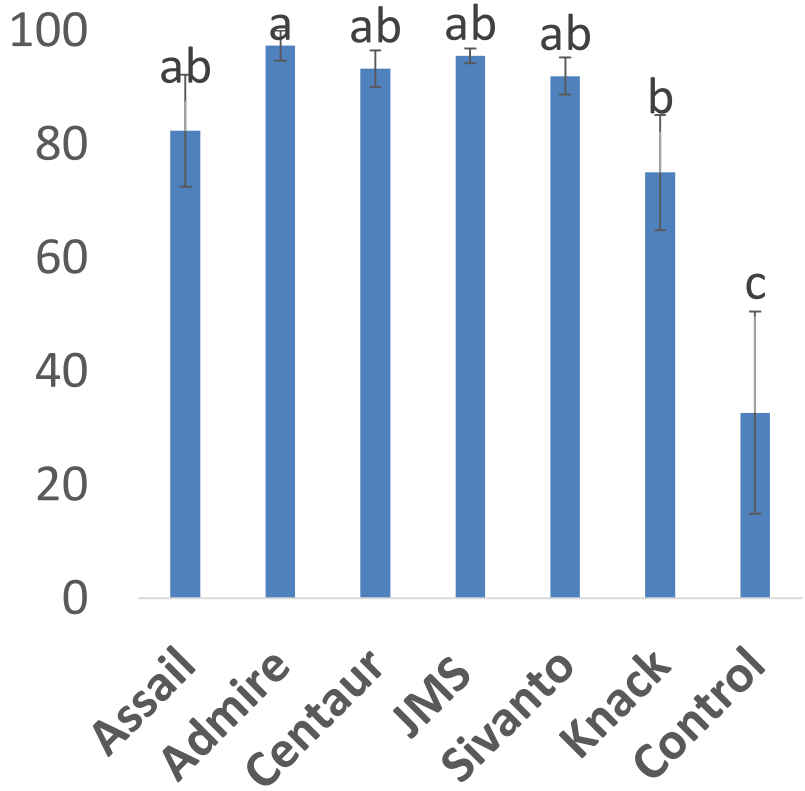
Coverage is the key to scale control



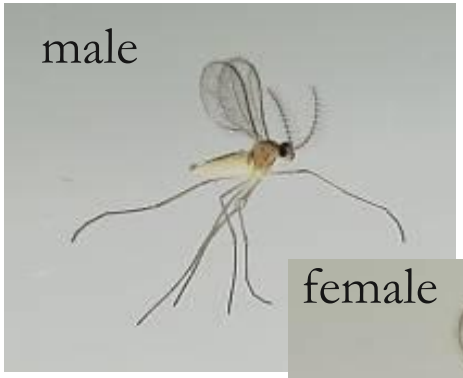
Scale mortality
(Treatments applied in November)



Scale mortality
(Treatments applied in August)



Blueberry Gall Midge (~3 mm)



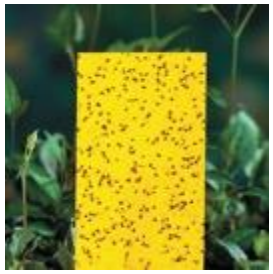
- **Females lay eggs in flower & vegetative buds as bud scale separate, late Stage 2**
- **Flower buds are susceptible in stages 2, 3 (February to March for Rabbiteye)**
- **Up to 80% flower bud loss (Lyrene, FL 2004)**
- **Midge injury is easily underestimated: Midge-aborted flower buds are readily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

Blueberry Gall Midge

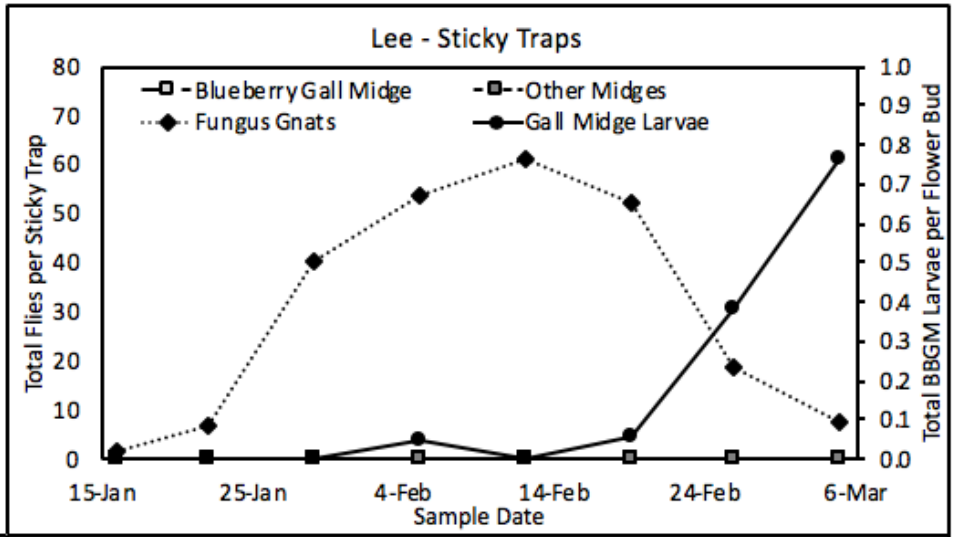
Monitoring

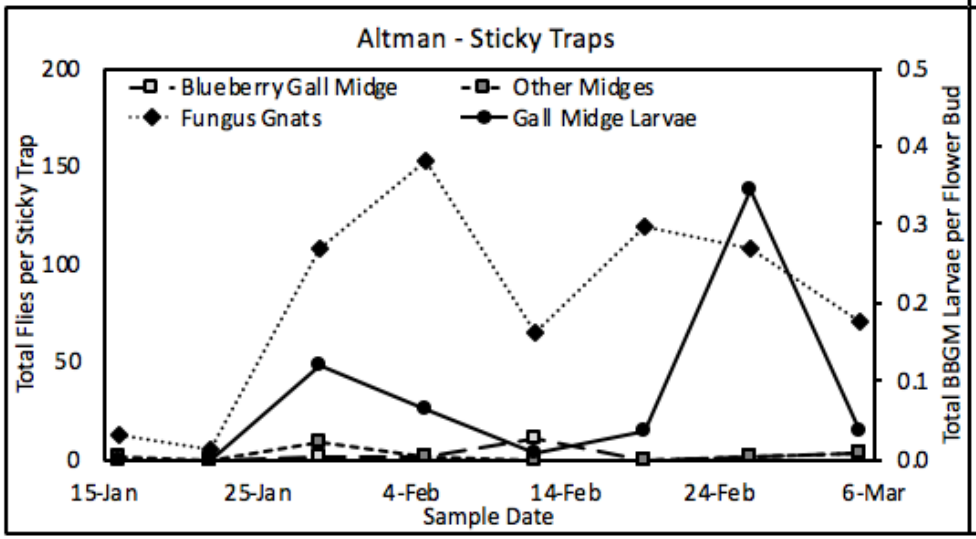
- **Collect flower buds 2 to 3 times per week**
- **Place them in zip-lock bags to monitor for larval infestation**
- **Use double-sided sticky sheets to capture adults**
- **Use bucket traps to monitor adult emergence (may be less efficient)**

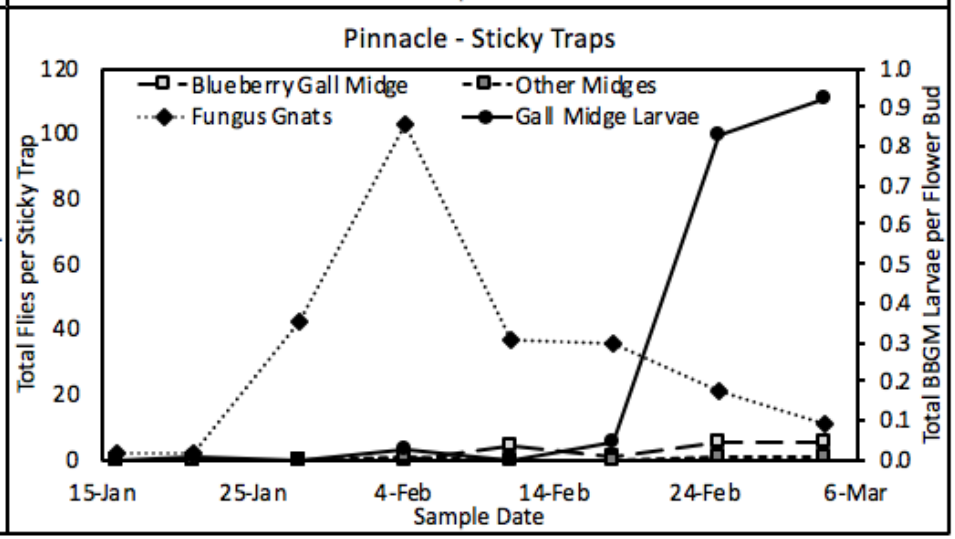
Blueberry Gall Midge Monitoring



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







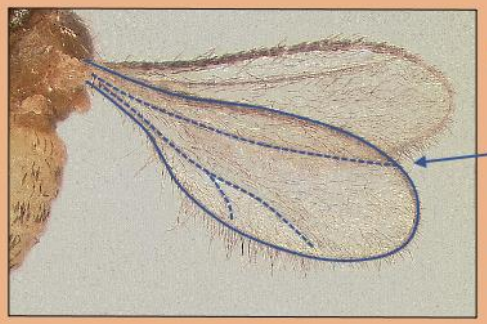
Blueberry Gall Midge Identification

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.

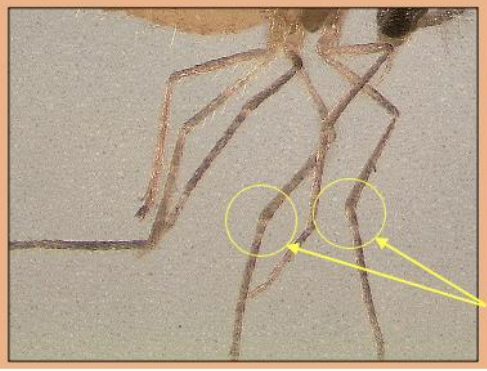
Adult Characteristics



Few wing veins

Vein meets edge before wingtip

Wings covered with hairs



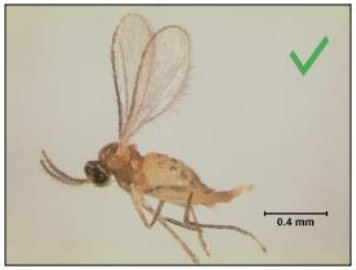
Light orange body

Long legs

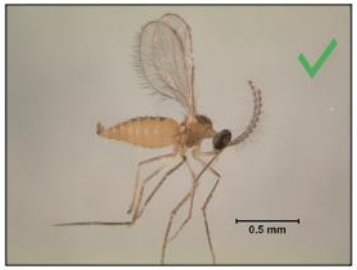
No spurs on legs

Other Small Flies

Don't be fooled by imposters

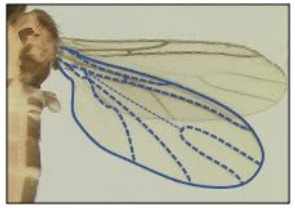


Blueberry Gall Midge Female



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

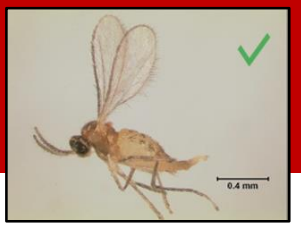
Blueberry Gall Midge (~3 mm)

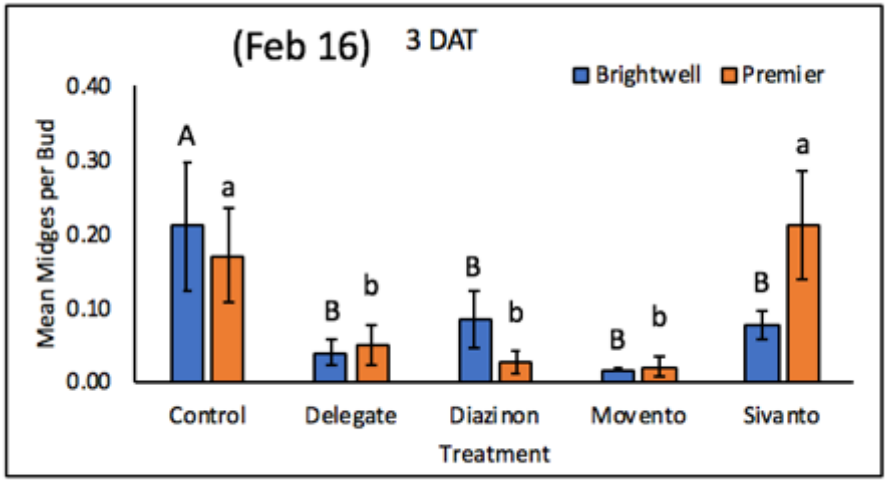
Control:

- 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, and Movento
- Midge insecticides are protectants:
  - They don't control existing larval infestations
  - Thorough coverage is a must

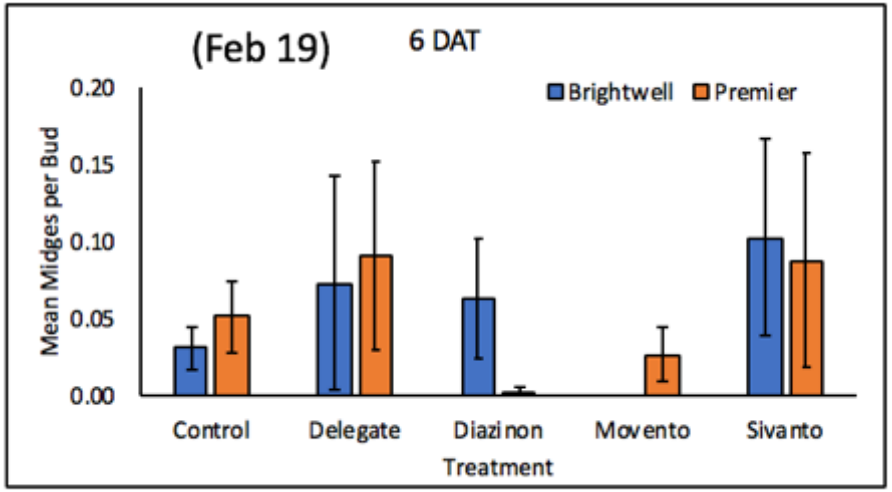
Spray timing is the key to gall midge control

Gall Midge

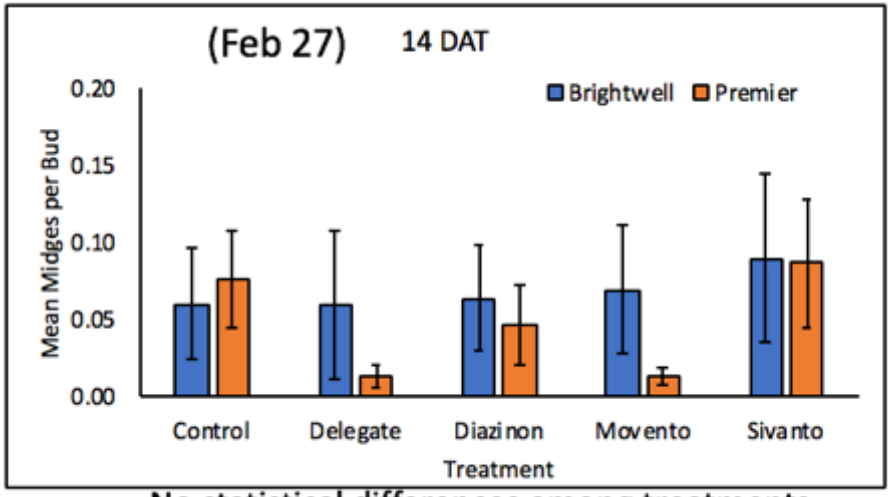




Bars with the same letter are not statistically different



No statistical differences among treatments



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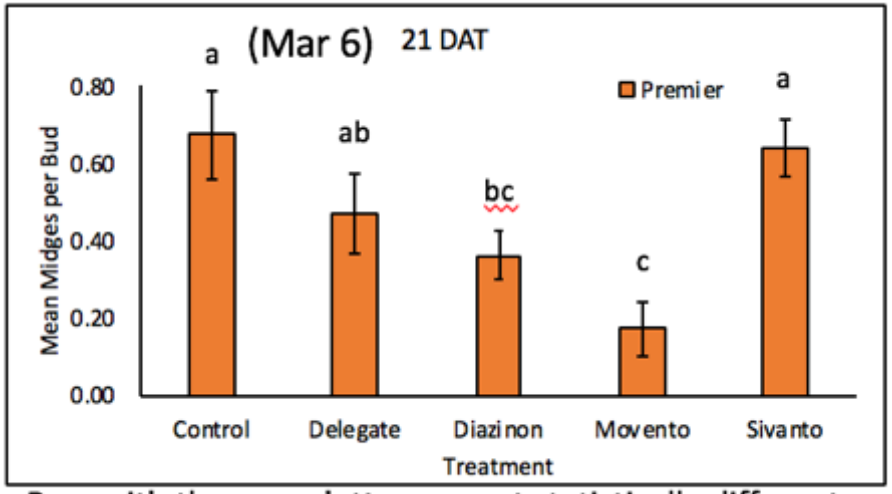


Bars with the same letter are not statistically different

Flower Thrips (1-2 mm)

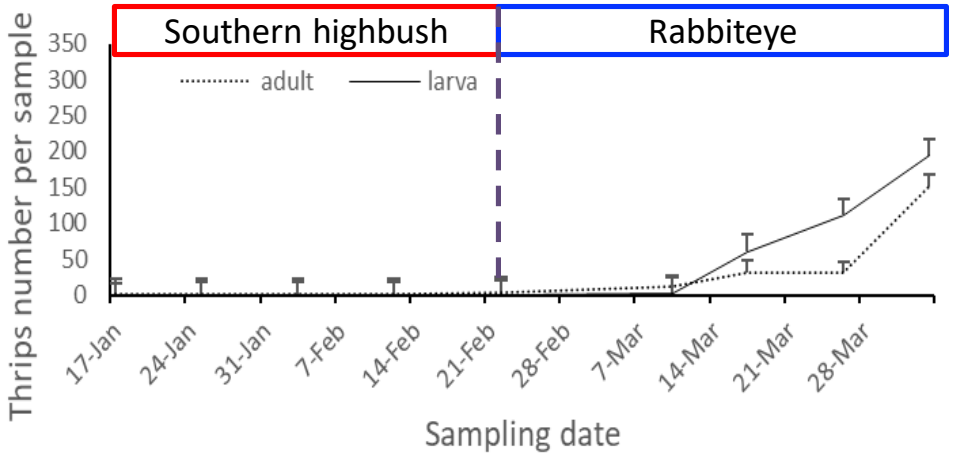
- Many species found in Georgia blueberries
  (*Frankliniella tritici, F. occidentalis, F. bispinosa*)
- Feed on leaf and flower surfaces
- Active before, during, and after bloom
- May move from other flowers to blueberry
- Feed on the internal parts of flowers, reducing pollination and fruit set
- Damage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

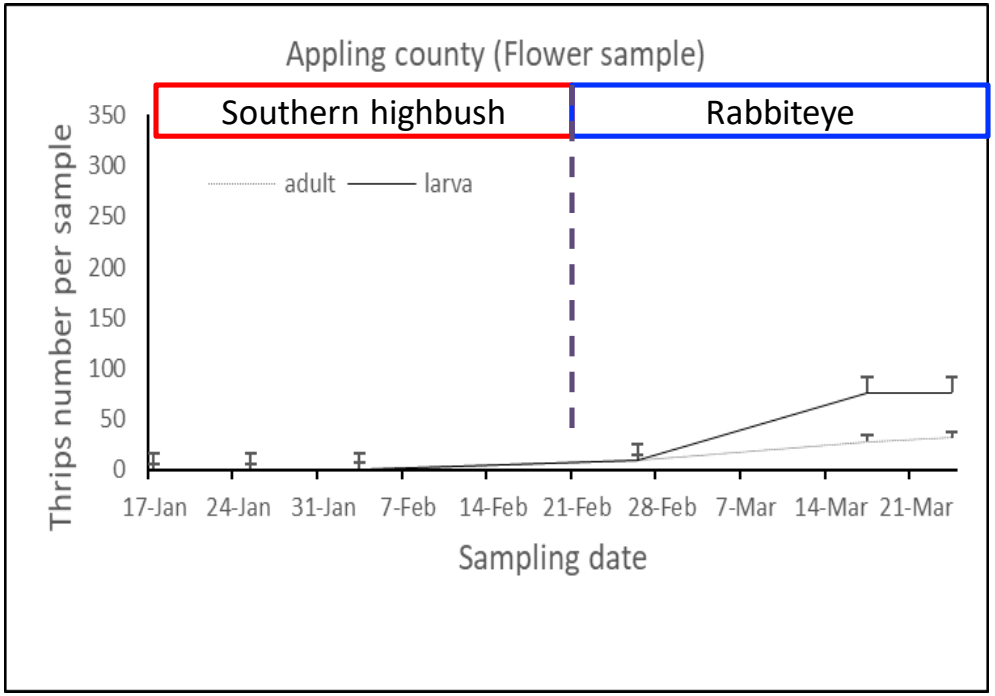
Injury to flowers

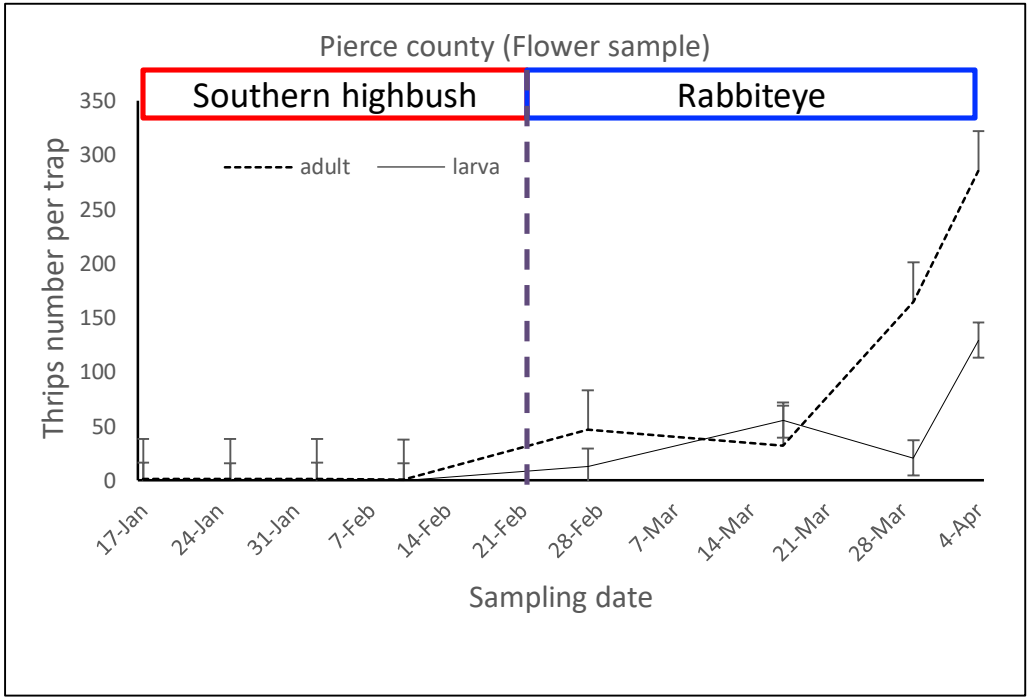
Feeding Injury

Injury to fruits

Flower Thrips (1-2 mm)







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

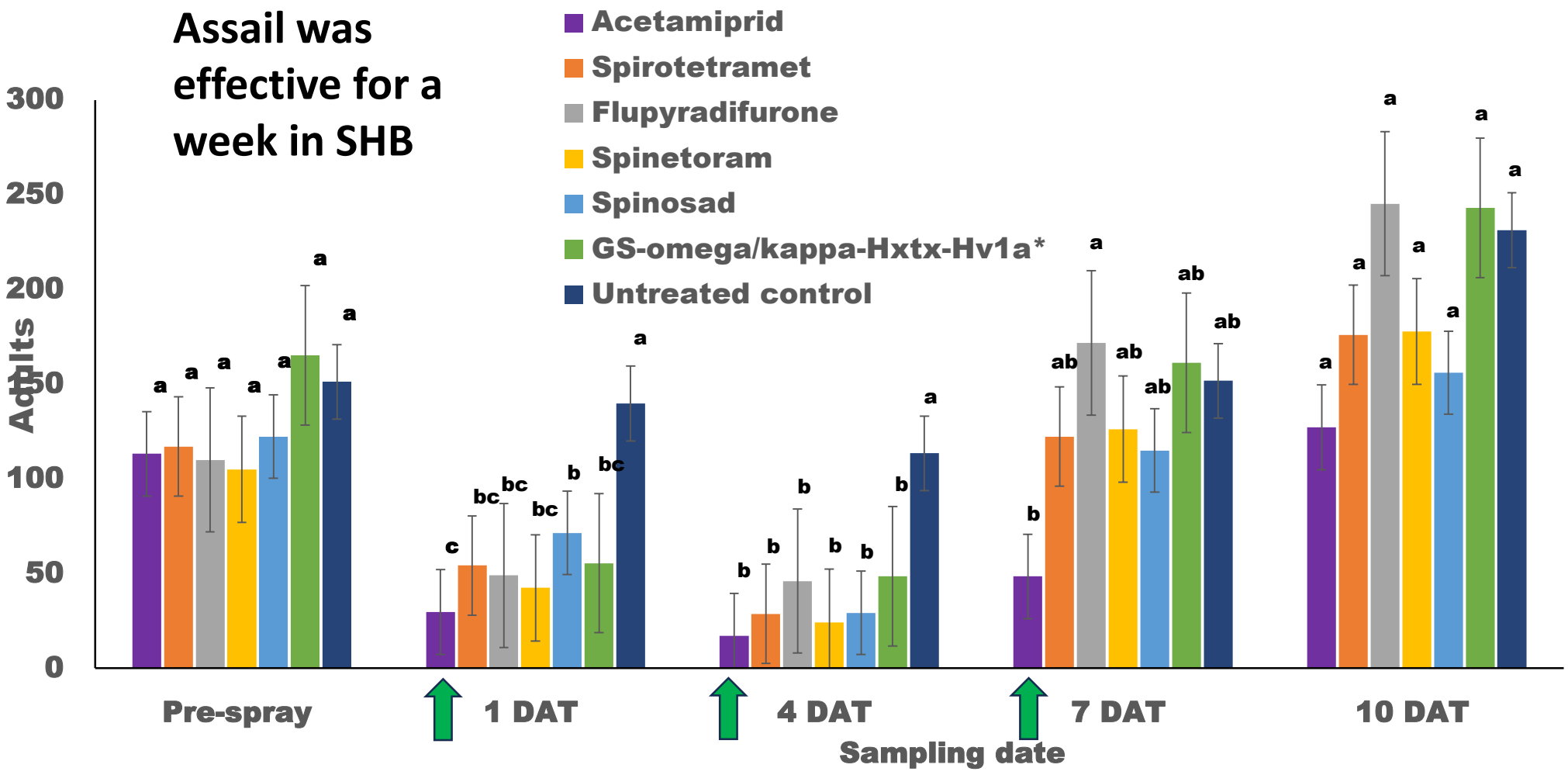
Thresholds:

- **> 2 per cluster of eight flowers**

CONTROL:

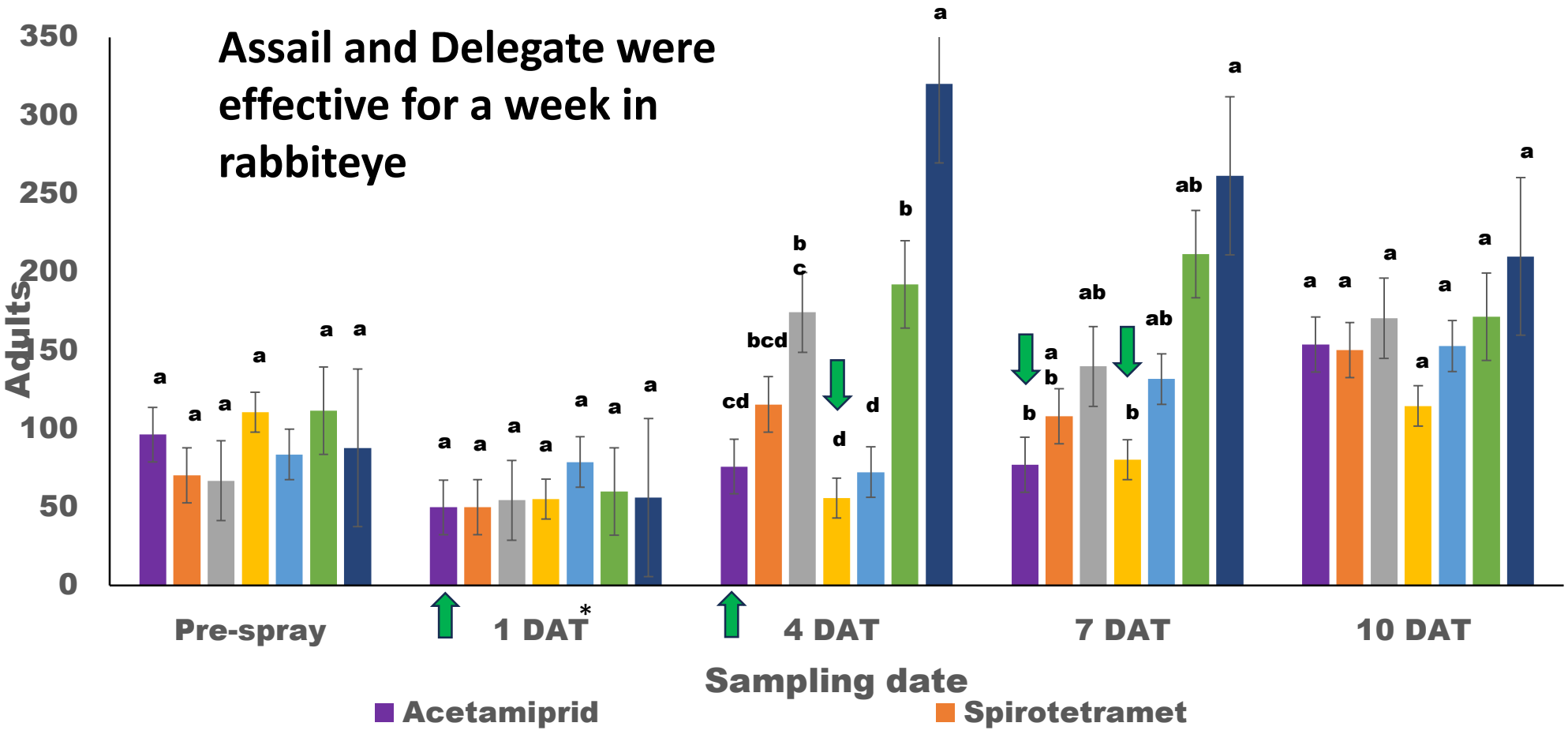
- **Diazinon early, followed by Entrust, Delegate, Assail, or Sivanto**

Thrips Management



Insecticide efficacy against flower thrips adults in southern highbush blueberry

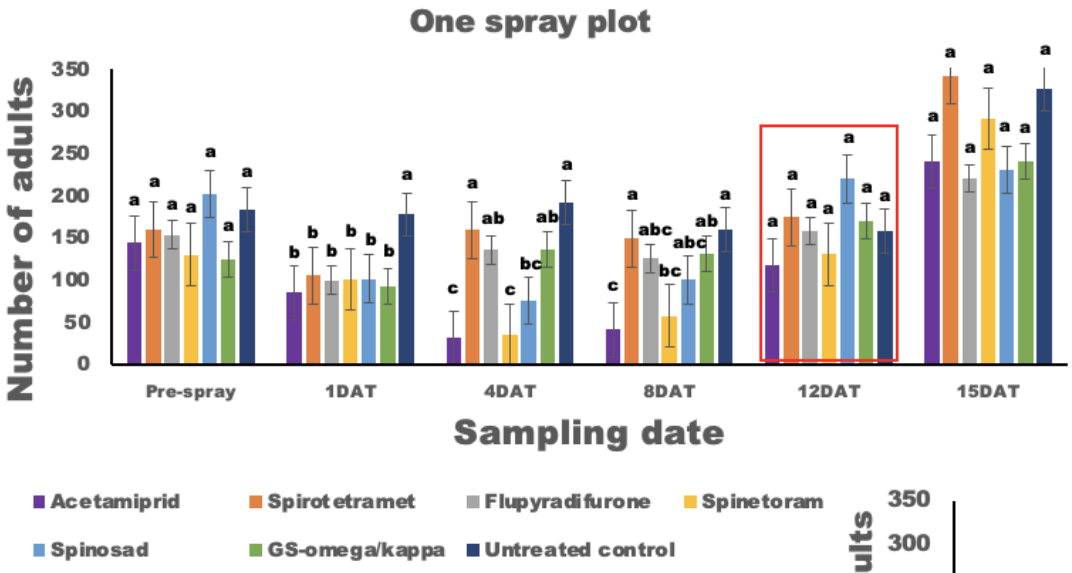
Thrips Management

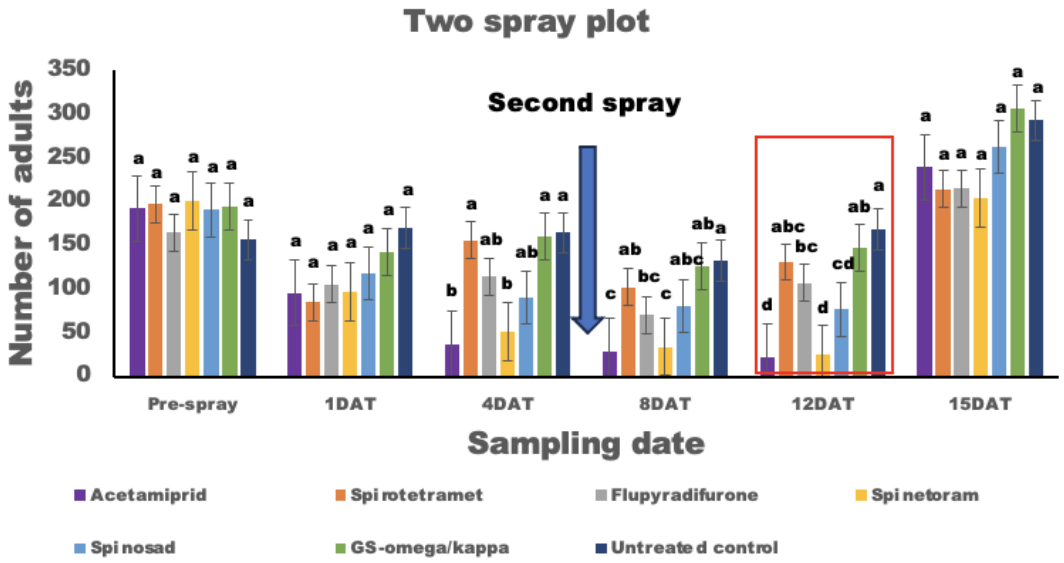


Insecticide efficacy against flower thrips adults in rabbiteye blueberry

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**

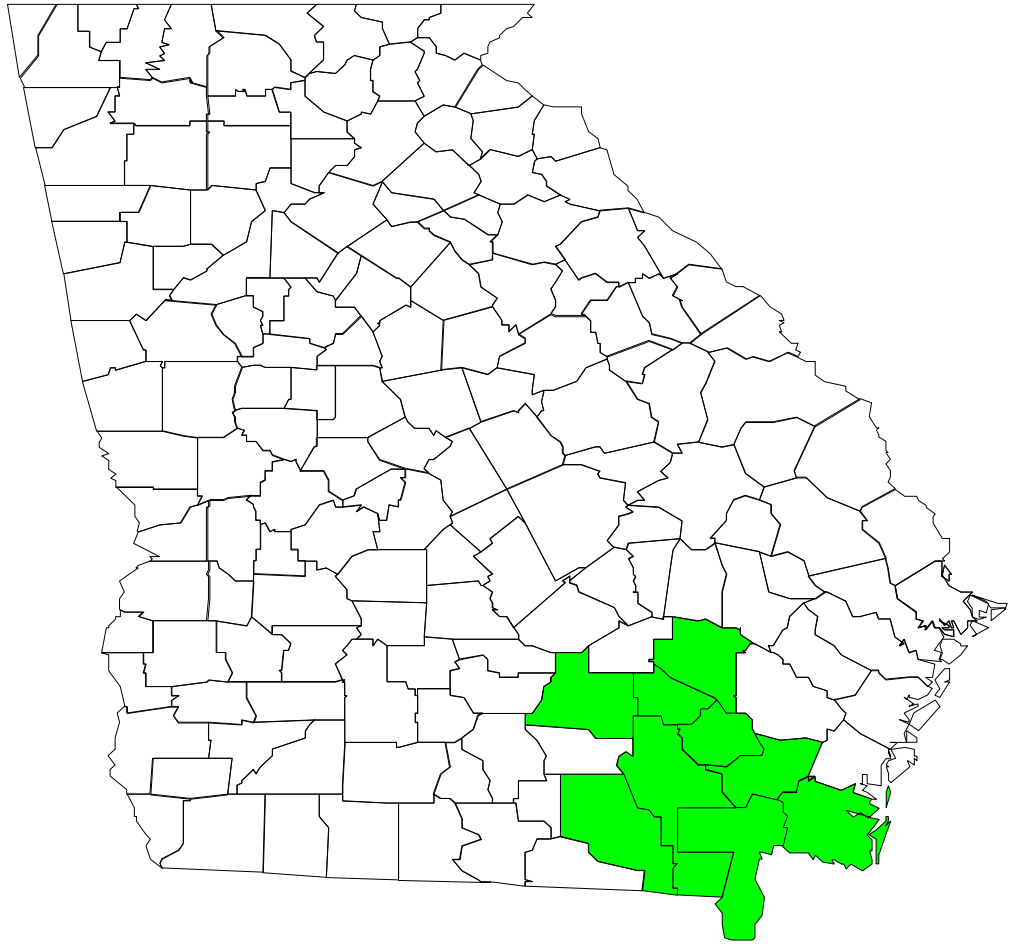
Chilli Thrips

- 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

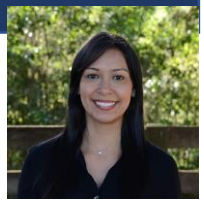
Reduce plant vigor and number of berries the following season

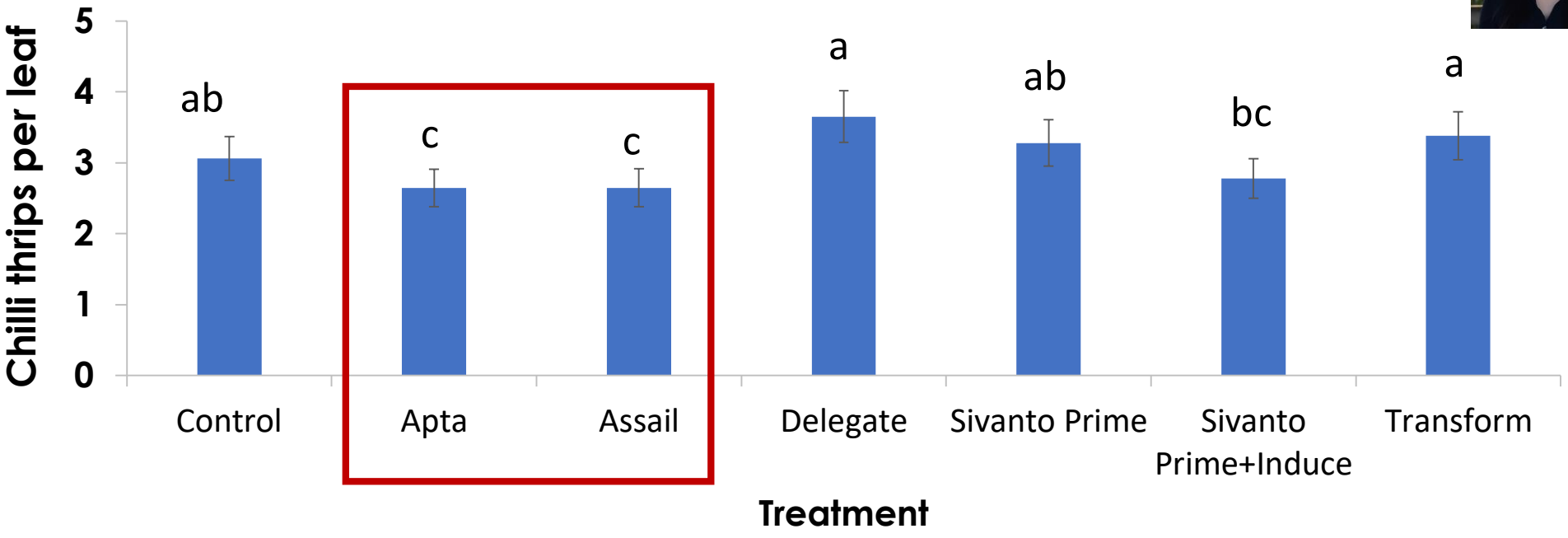
Photos by B. Panthi, L. Buss, and S. Lahiri

Insecticide Treatments

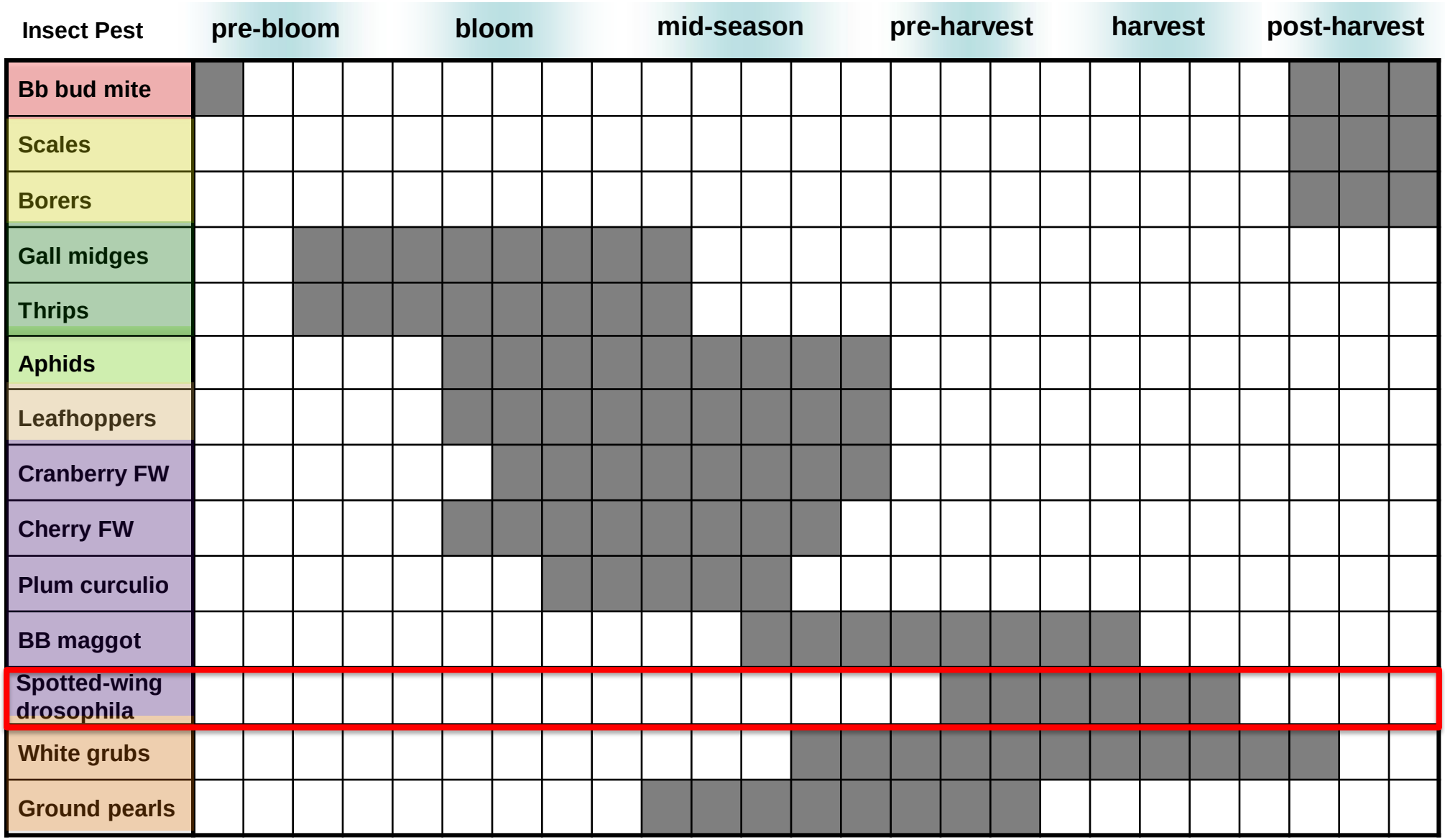
Treatment (Active Ingredient, AI)	Insecticide Brand Name	Rate (AI/ac)	Group No.	Mode of Action
Tolfenpyrad	**Apta® 15 SC**	27 fl oz/acre	21A	METI I
Acetamiprid	**Assail® 30 SC**	5.3 oz /acre	4A	Neonicotinoid
Spinetoram	**Delegate® WG**	7 oz/acre	5	Nicotinic receptor allosteric modulator
Flupyradifurone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

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



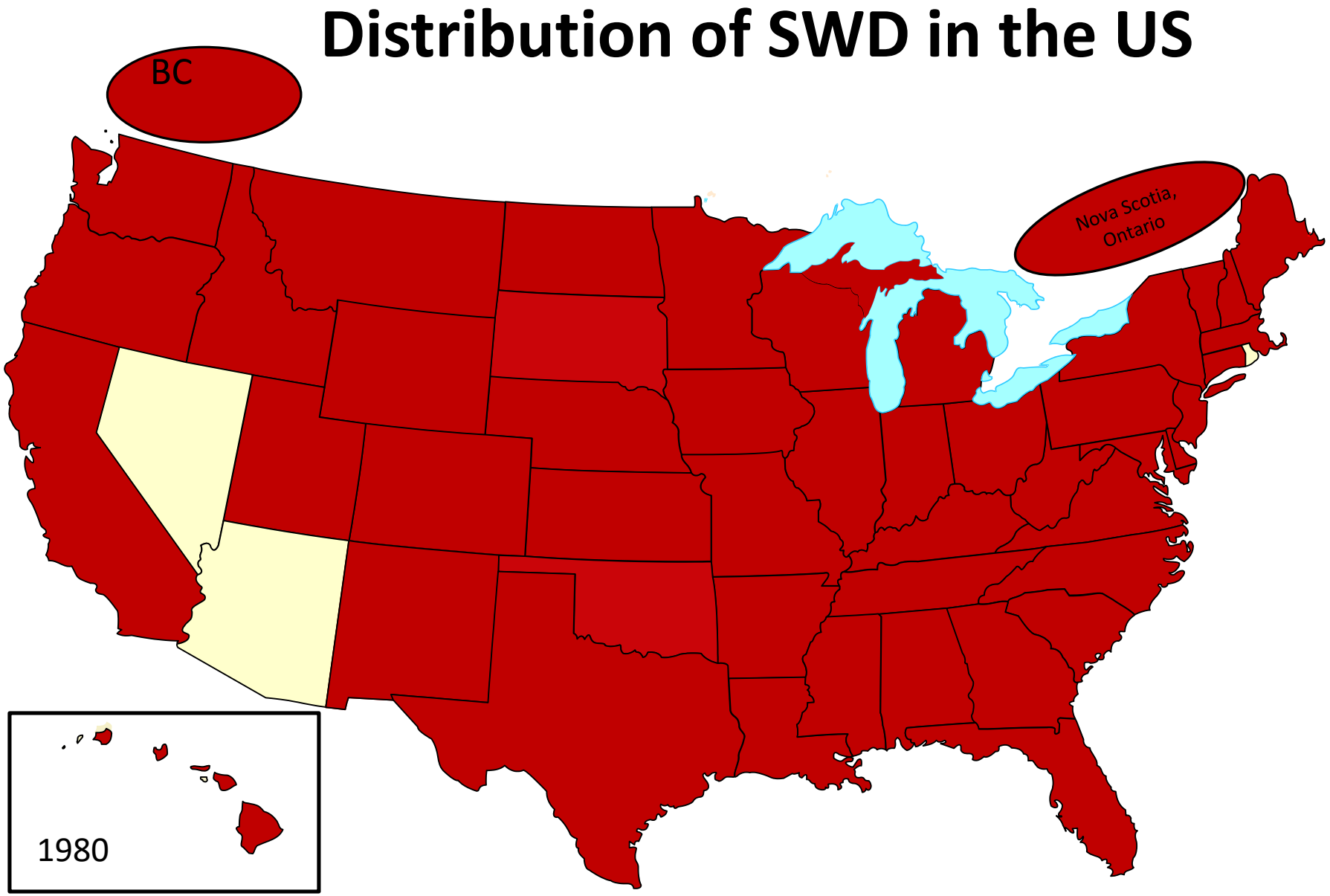


Economically-important activity periods of arthropod pests*



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

Spotted-Wing Drosophila (SWD)



Spotted-Wing Drosophila (SWD)

Female

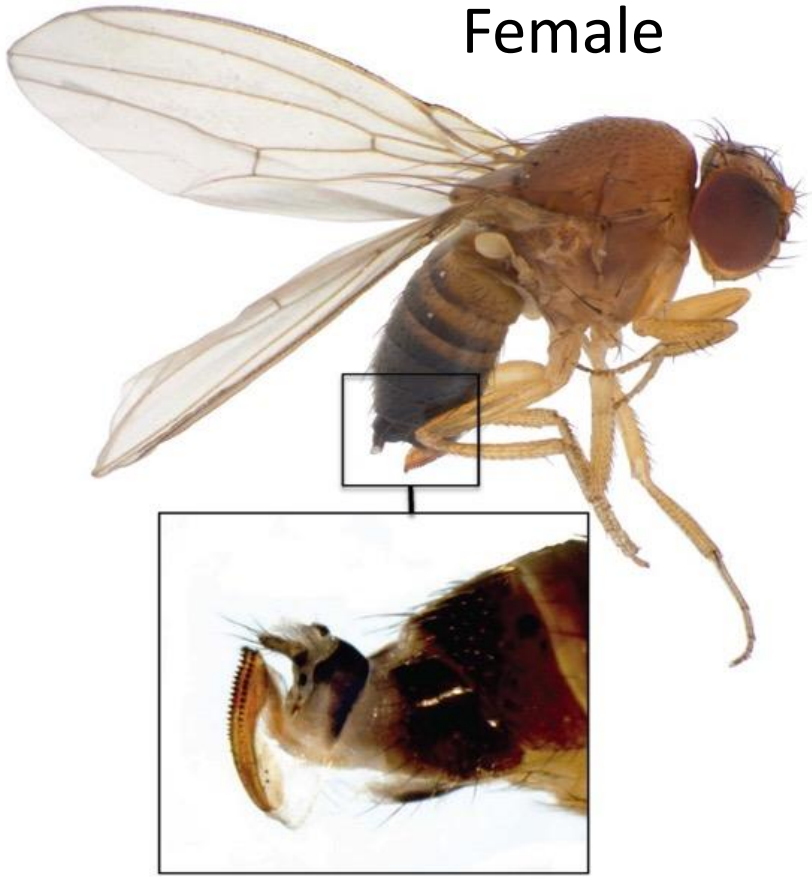
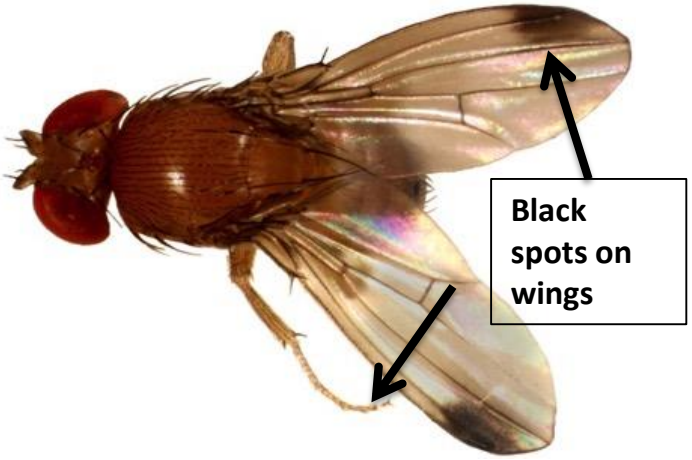
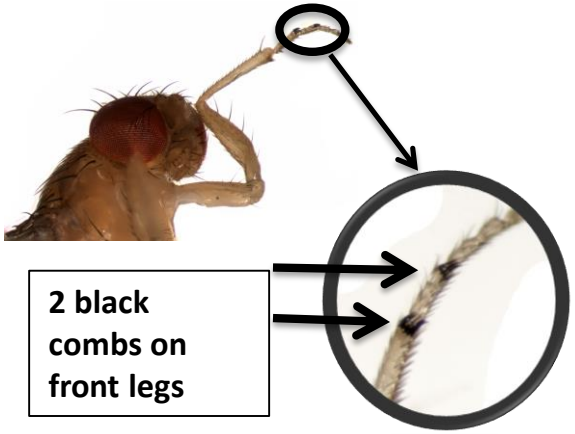


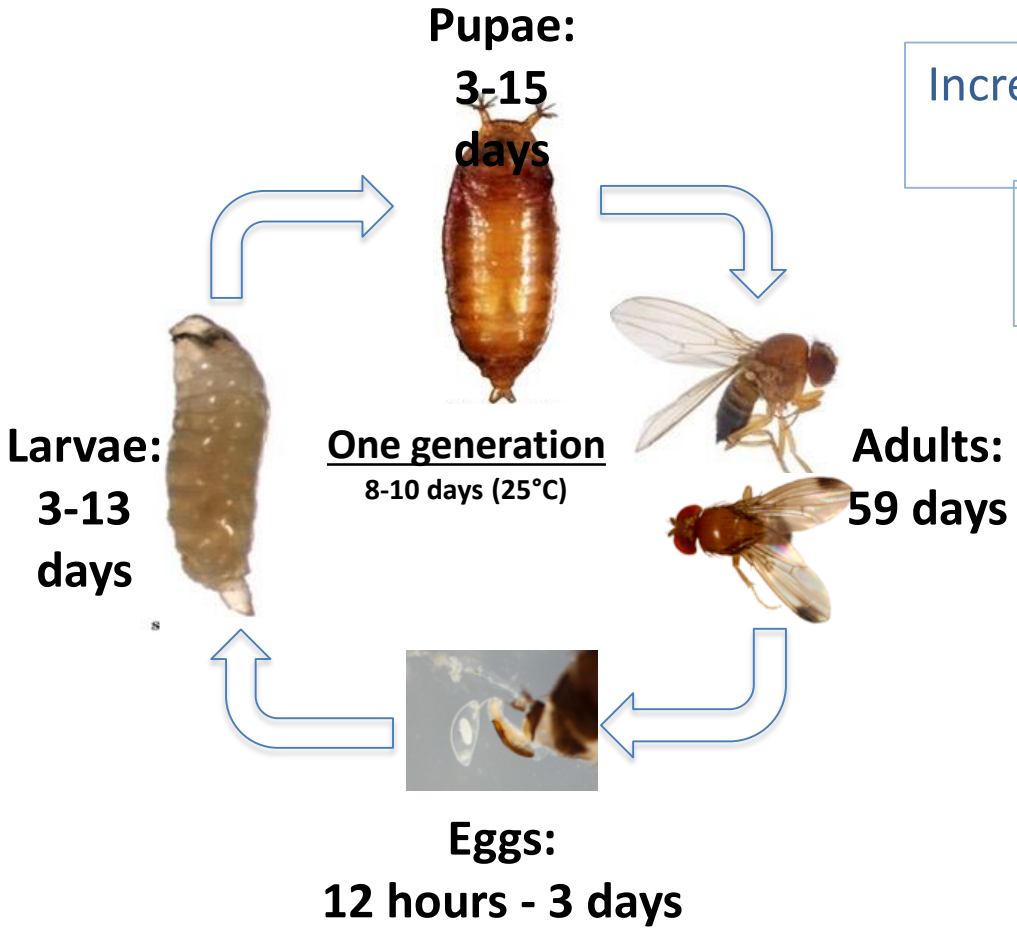
Figure 2. SWD Female and serrated ovipositor

Male





Spotted-Wing Drosophila (SWD)



Increased Management Costs
$129 million

Annual Crop Losses
$718 million

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

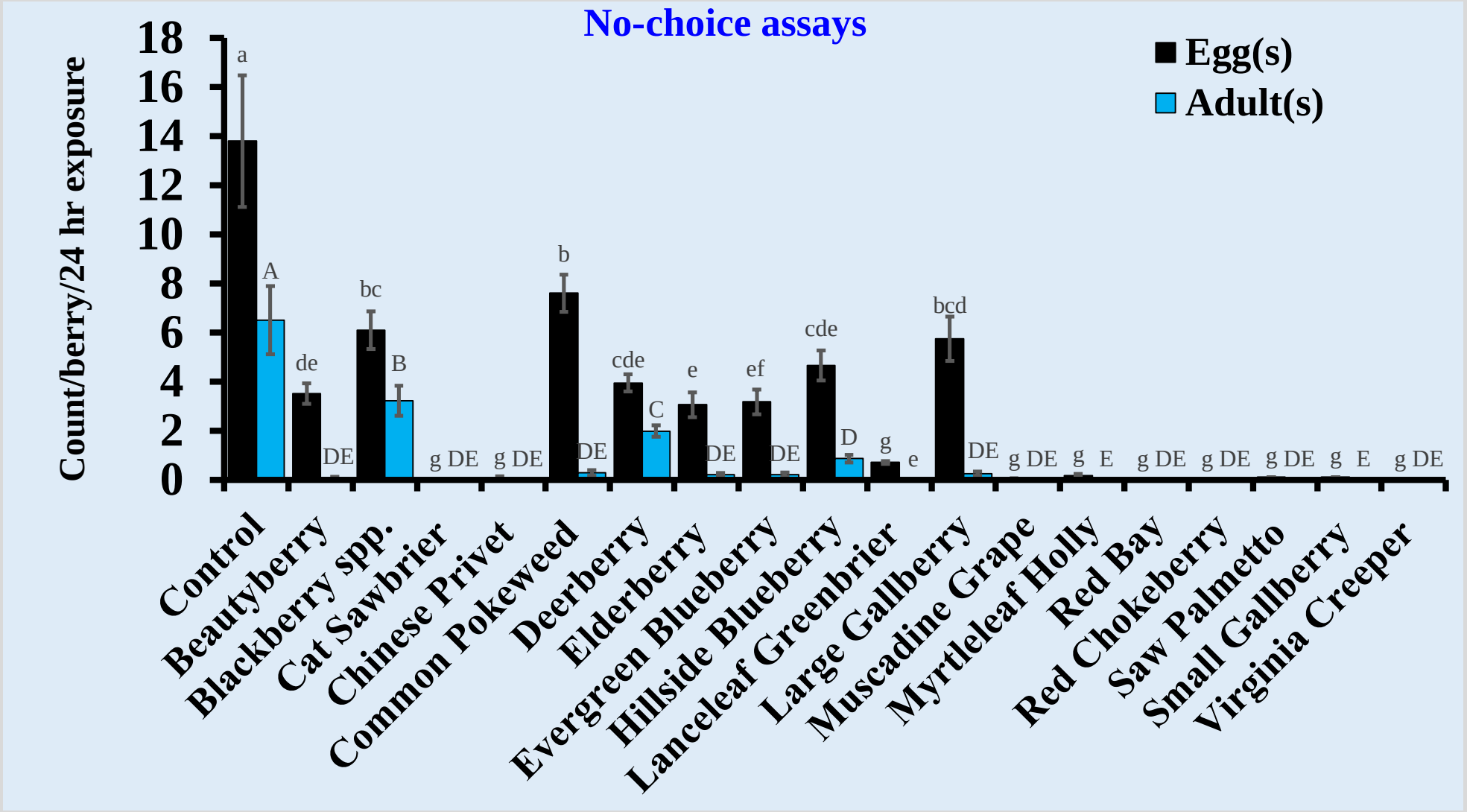

Vaccinium spp.


Elderberry


Large Gallberry


Vaccinium spp.

Alternate Hosts

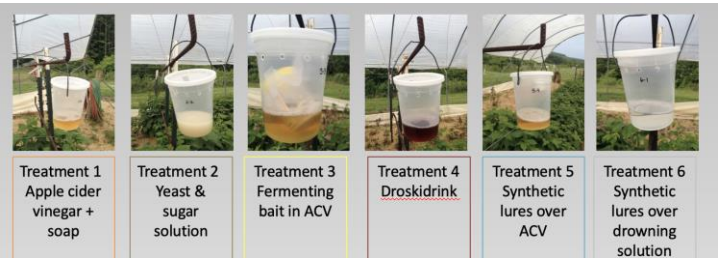


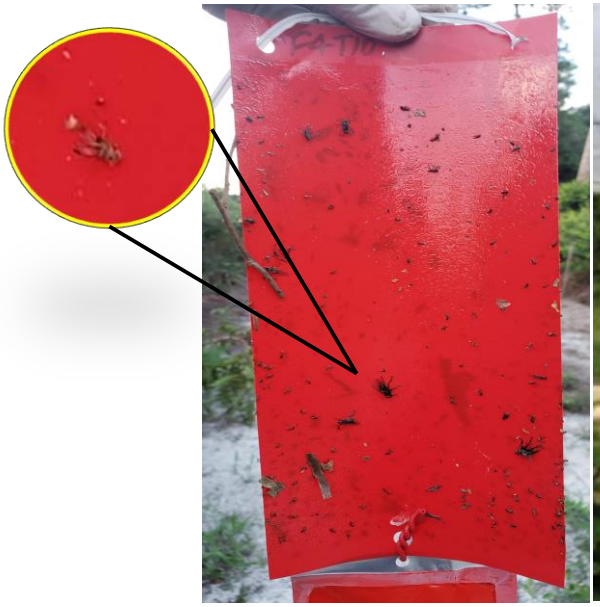
SWD oviposition and adult eclosion per berry (Mean ± SEM) in 2016

Monitoring SWD: Wet vs Dry Traps

SWD Standard Trap Test - 2011

		
Haviland trap mesh top, cover	Modified Haviland trap (10 holes in sides, no cover)	Van Steenwyk trap, 1 qt ice cream, mesh top, cover
		
Deli cup (1 qt, 10 holes in sides)	Red cup (1 qt, 10 holes in sides)	Contech (2 holes in sides)





(Panthi et al. 2022)

Dry vs Wet Traps

Comparison of traps and lures for SWD monitoring in blueberry

Traps: Liquid vs Red Panel

Lures: Scentry BS, Trece BS, Trece HS, none

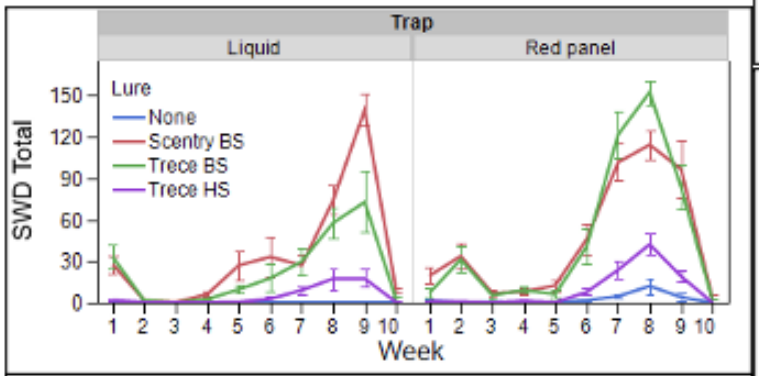
Field sites: Border, Inside, Woods

Measurements:

Effectiveness (number of SWD),

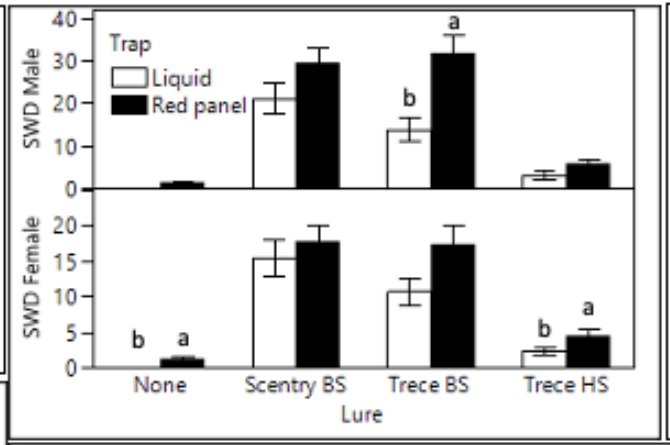
Sensitivity (time of 1st capture), and

Selectivity (proportion of SWD/total drosophilids)



Sensitivity

Both traps with all three lures captured SWD flies in the first week.



Effectiveness

- Red panel captured more flies than liquid traps.
- The difference was more prominent in male captures but only with Trece lures (Trece BS and Trece HS).
- Traps with Scentry lure captured similar flies.

Selectivity

Liquid traps were more selective than red panel to male and female SWD

Among lures, Trece HS was highly selective to male and female SWD.

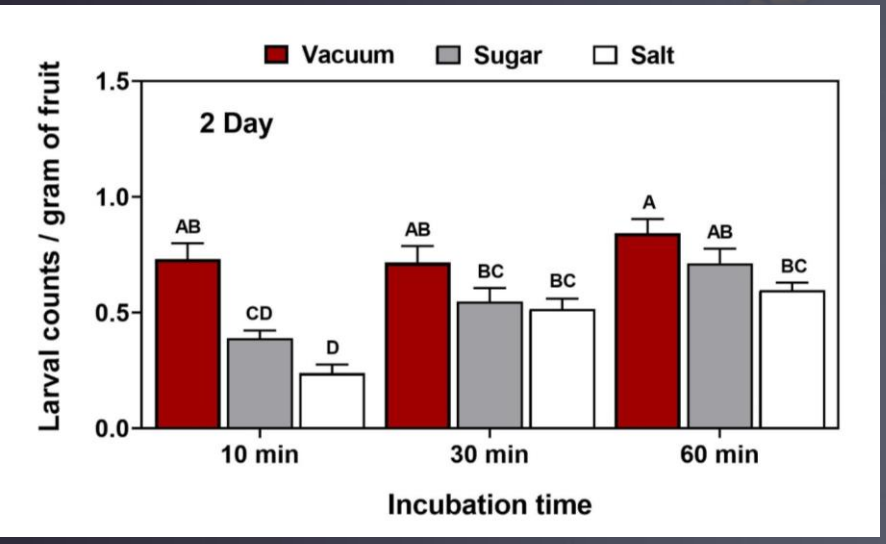
The selectivity of red panel traps improved with Trece HS lure.

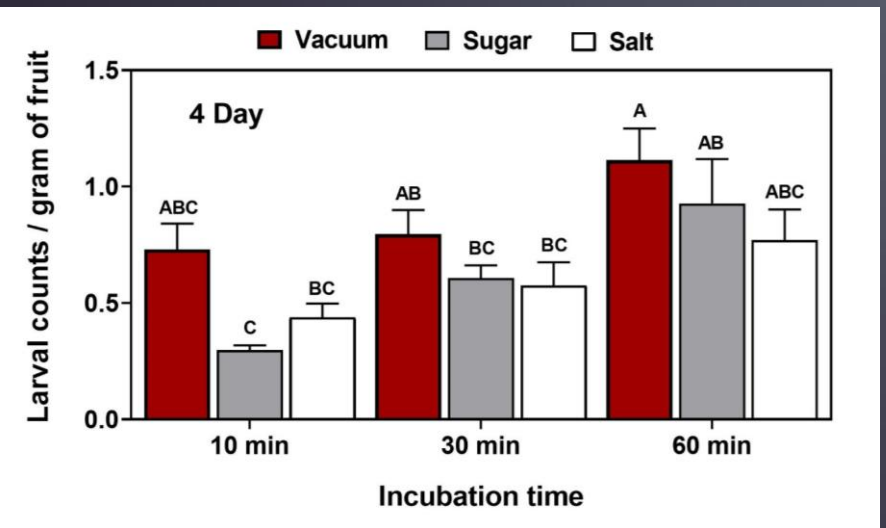
Current SWD larval sampling methods in small fruits

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

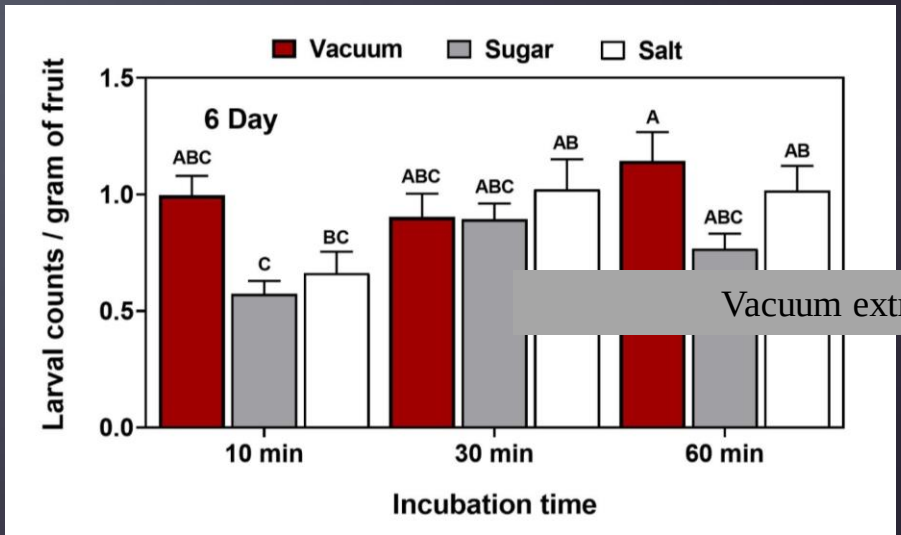
Van Timmeren et al. 2017

Comparison of larval extraction methods





- 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.

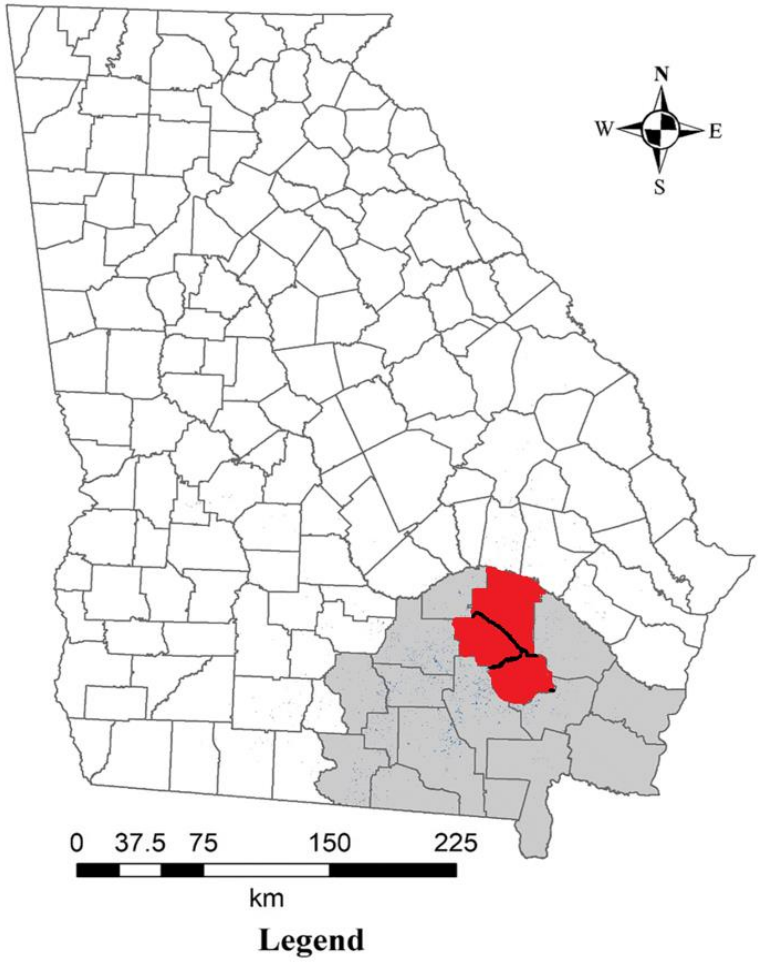


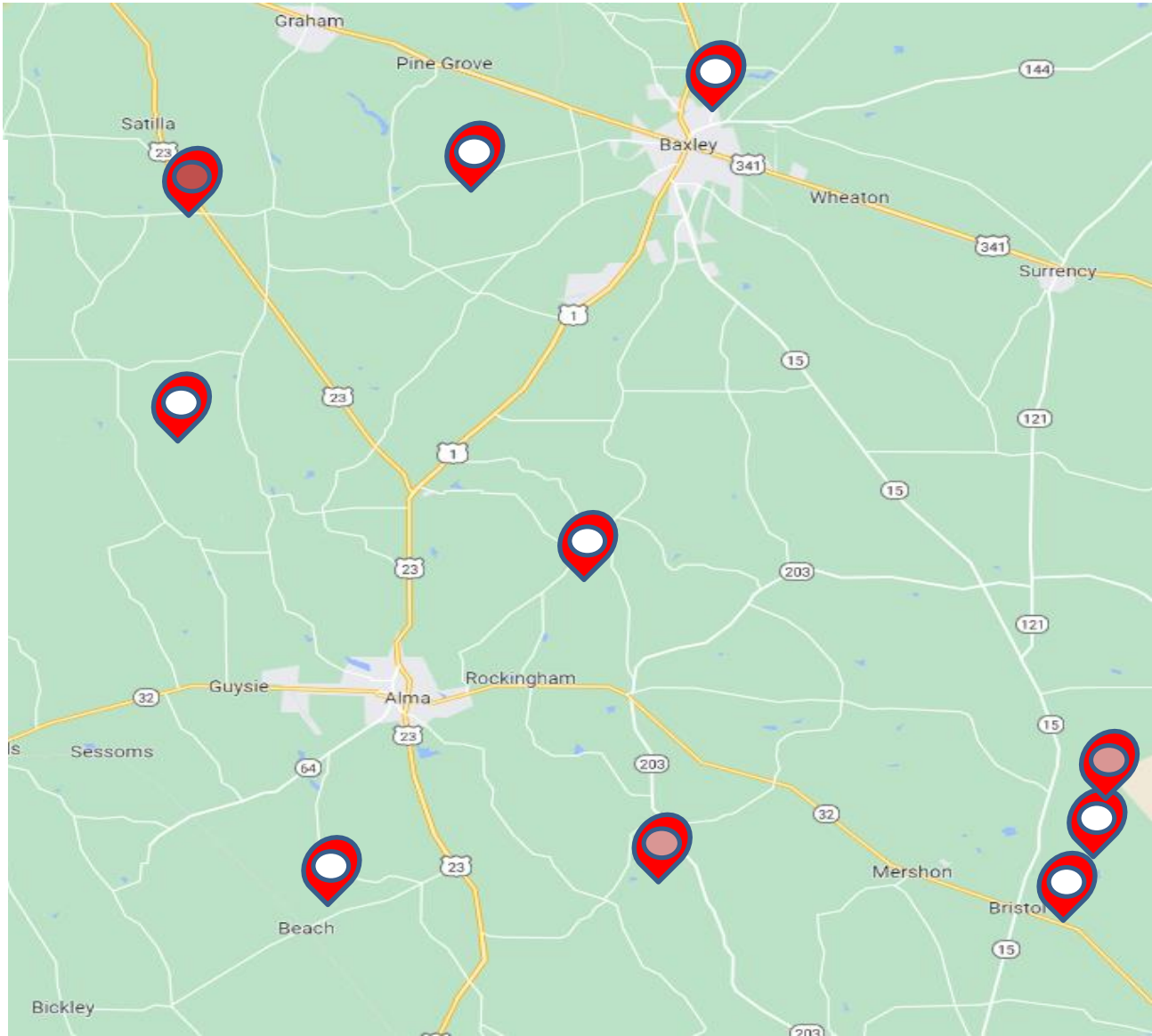
SWD Management

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

Biological control

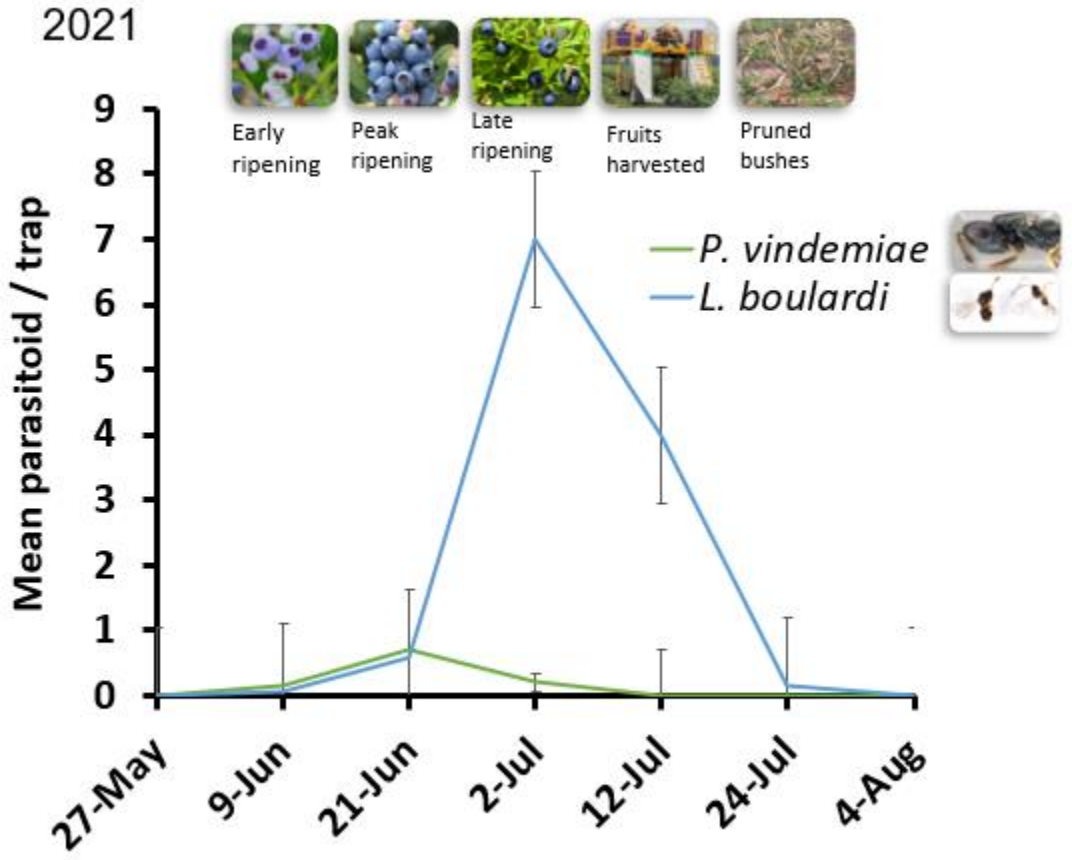
Survey of resident parasitoids

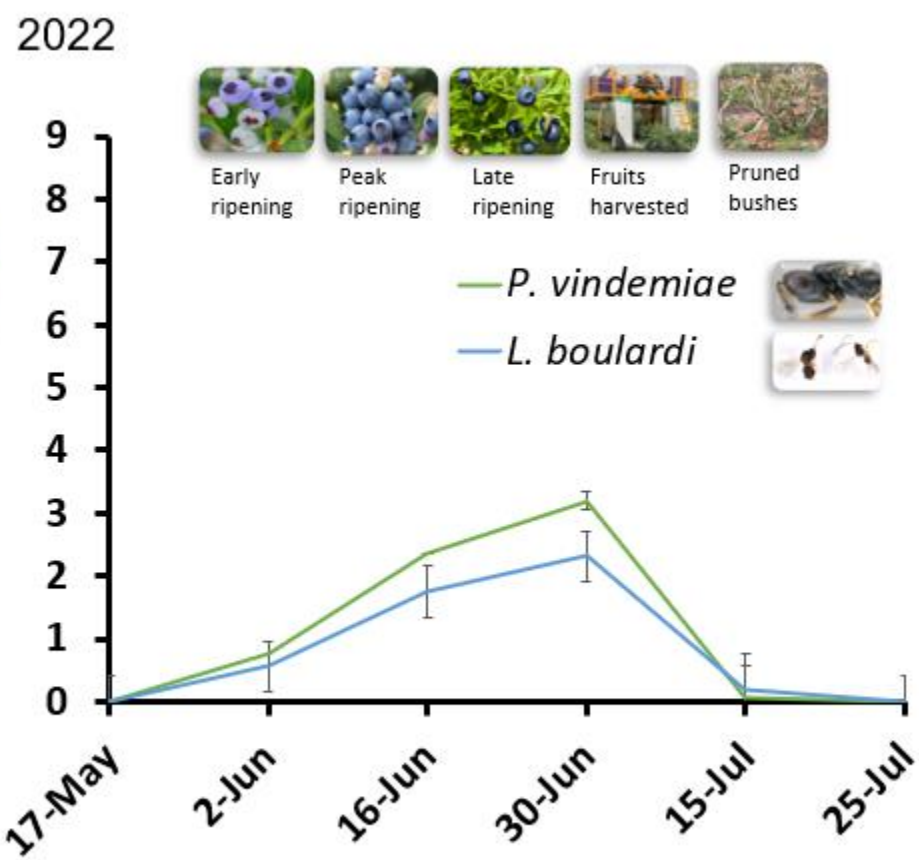




Biological control

Survey of resident parasitoids

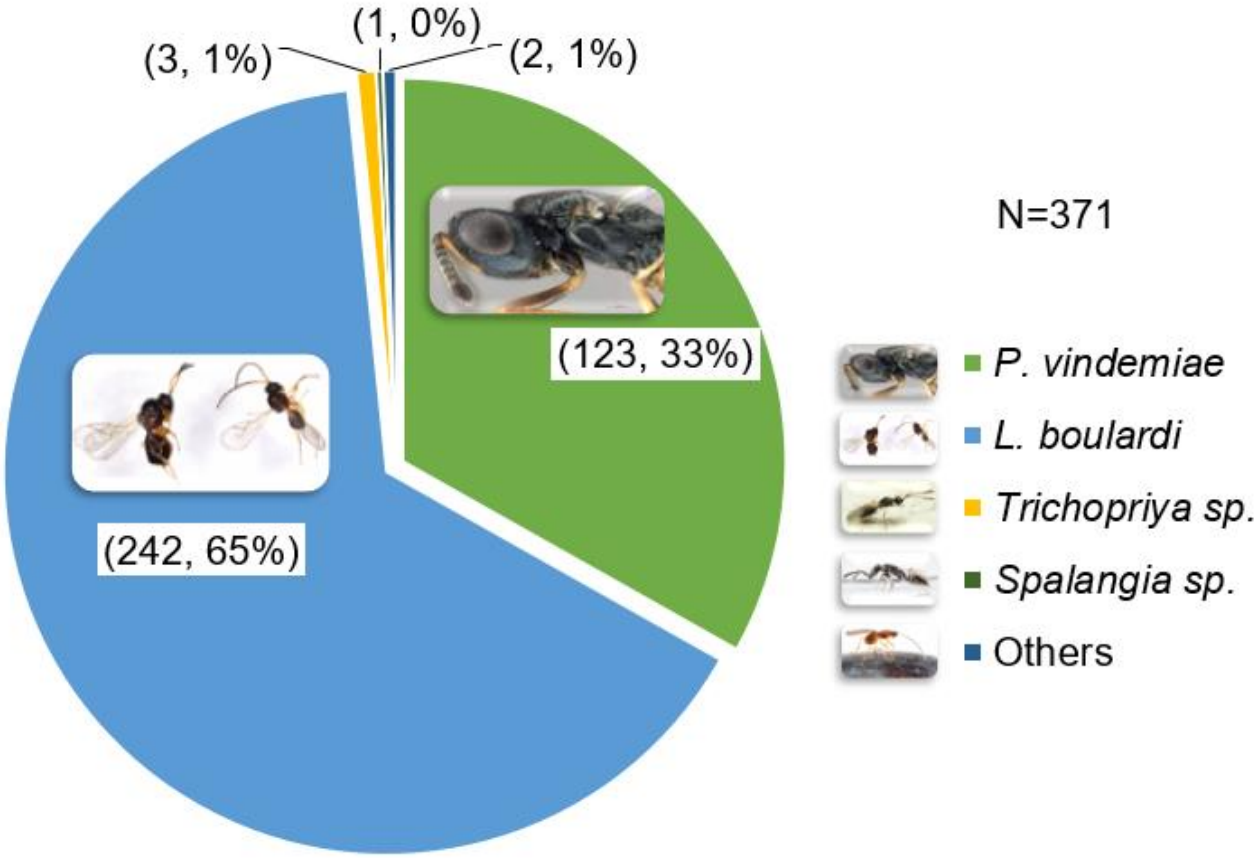




Sampling dates

Biological control

Survey of resident parasitoids



Biological control

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 20737

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

This permit was generated electronically via the ePermits system

PERMITTEE NAME:	Dr. Kent Daane	**PERMIT NUMBER:**	P526P-21-05491
ORGANIZATION:	University of California	**APPLICATION NUMBER:**	P526-210803-604
ADDRESS:	9240 South Riverbend Avenue Kearney Agricultural Center Parlier, CA 93648	**DATE ISSUED:** **EXPIRES:**	09/22/2021 09/22/2024
MAILING ADDRESS:	9240 South Riverbend Avenue Kearney Agricultural Center Parlier, CA 93648	**FACILITY NUMBER:** **HAND CARRY:**	N/A Yes
PHONE:	559-646-6522		
ALT. PHONE:	559-284-9931		
EMAIL:	kdaane@ucanr.edu, kmdaane@berkeley.edu		
FAX:			

DESTINATION: 9240 South Riverbend Avenue, Kearney Agricultural Center , Parlier, CA 93648
RELEASE: multiple, multiple, CA multiple, (County: multiple)

Under the conditions specified, this permit authorizes the following:

Regulated Article	Life Stage(s)	Intended Use	Shipment Origin	Originally Collected	Culture Designation
Ganaspis brasiliensis Any		Release - Biocontrol	CA	Originally Collected from Foreign Localities	Gb beneficial insects

PERMIT GUIDANCE

1) Importation, interstate movement, and environmental release of the listed regulated organisms that have been genetically engineered may require a different permit issued under regulations at 7 CFR part 340. Any unauthorized importation, interstate movement, or environmental release (including accidental release) of a regulated GE organism would be a violation of those regulations. Before moving genetically engineered organisms, contact APHIS Biotechnology Regulatory Services (BRS) at: https://www.aphis.usda.gov/aphis/ourfocus/biotechnology. If BRS does not require a permit, contact the Pest, Pathogen, and Biocontrol permit unit for further guidance at: pest.permits@usda.gov
2) If an animal pathogen is identified in your shipment, to ensure appropriate safeguarding, please refer to http://www.aphis.usda.gov/import_export/animals/animal_import/animal_imports_an products.shtml
3) If a human pathogen is identified, please refer to the CDC Etiologic Agent Import Permit Program at http://www.cdc.gov/od/eaipp/

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS	DATE
Robert DiFonzo	09/22/2021

Page 1 of 4

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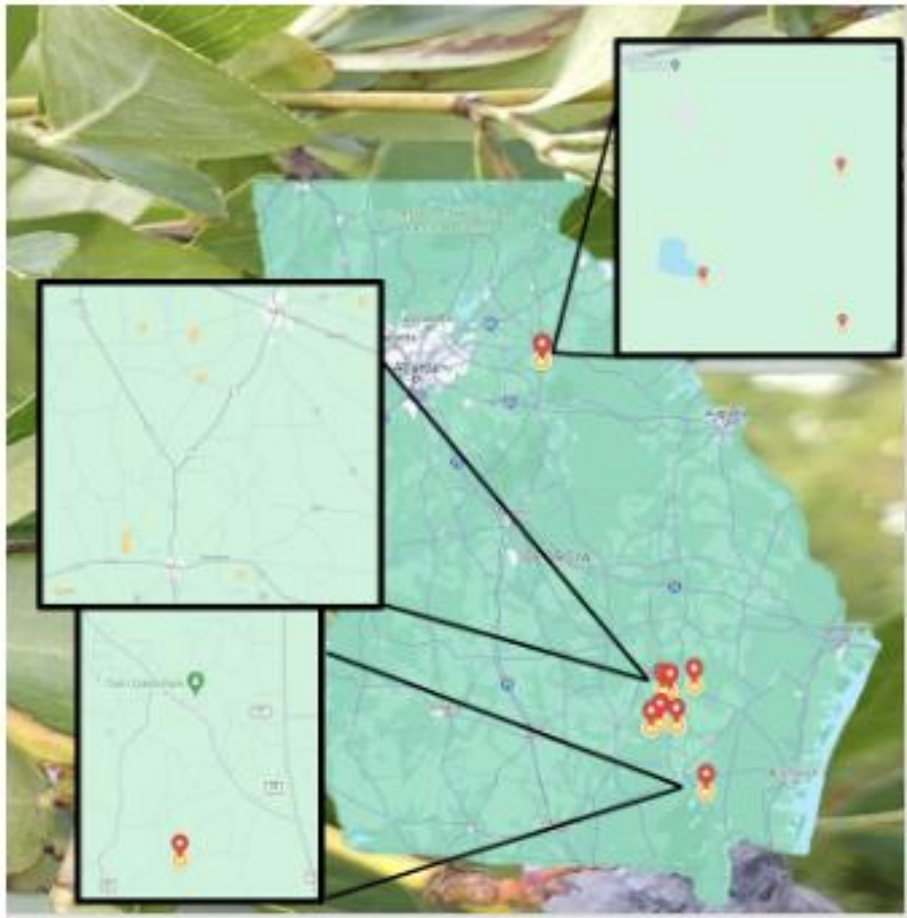
Biological control

Release of exotic parasitoid – *Ganaspis bransiliensis*

In 2022 and 2023, a total of 15,781 wasps (9,054 females and 5,761 males) were released at 18 sites and 9 unique locations. To determine establishment at the release sites, we plan to use sentinel traps or fruit samples.



Biological control

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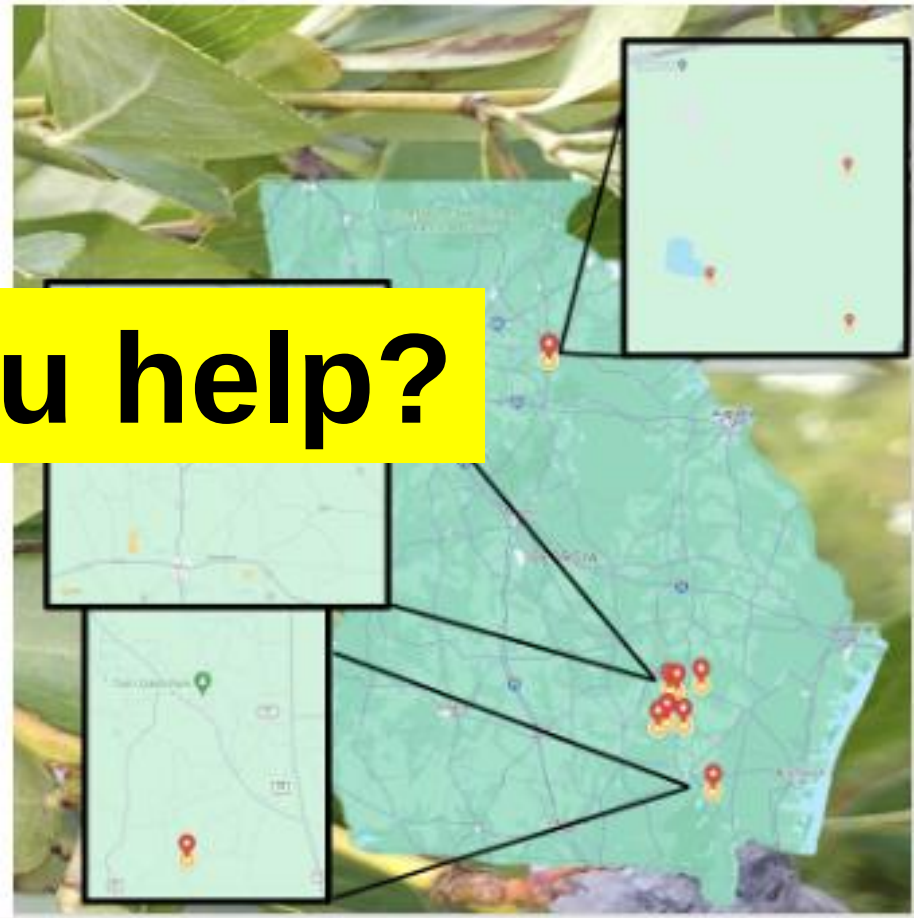
In 2022 and 2023, a total of 15,781 wasps (9,054 females and 5,761 males) were released at 18 sites and 9 unique locations. To determine establishment at the release sites, we plan to use sentinel traps or fruit samples.

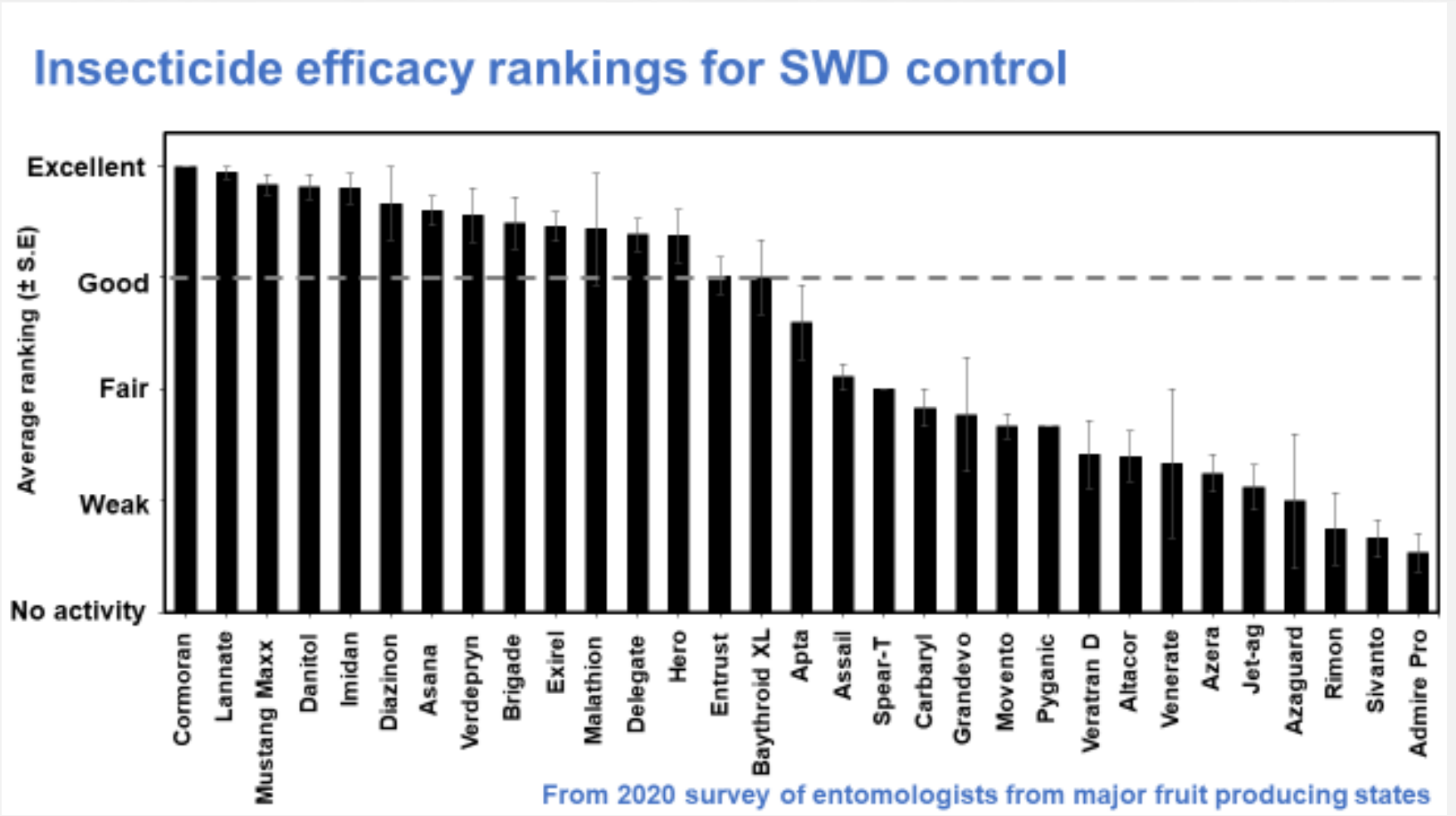
How can you help?



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



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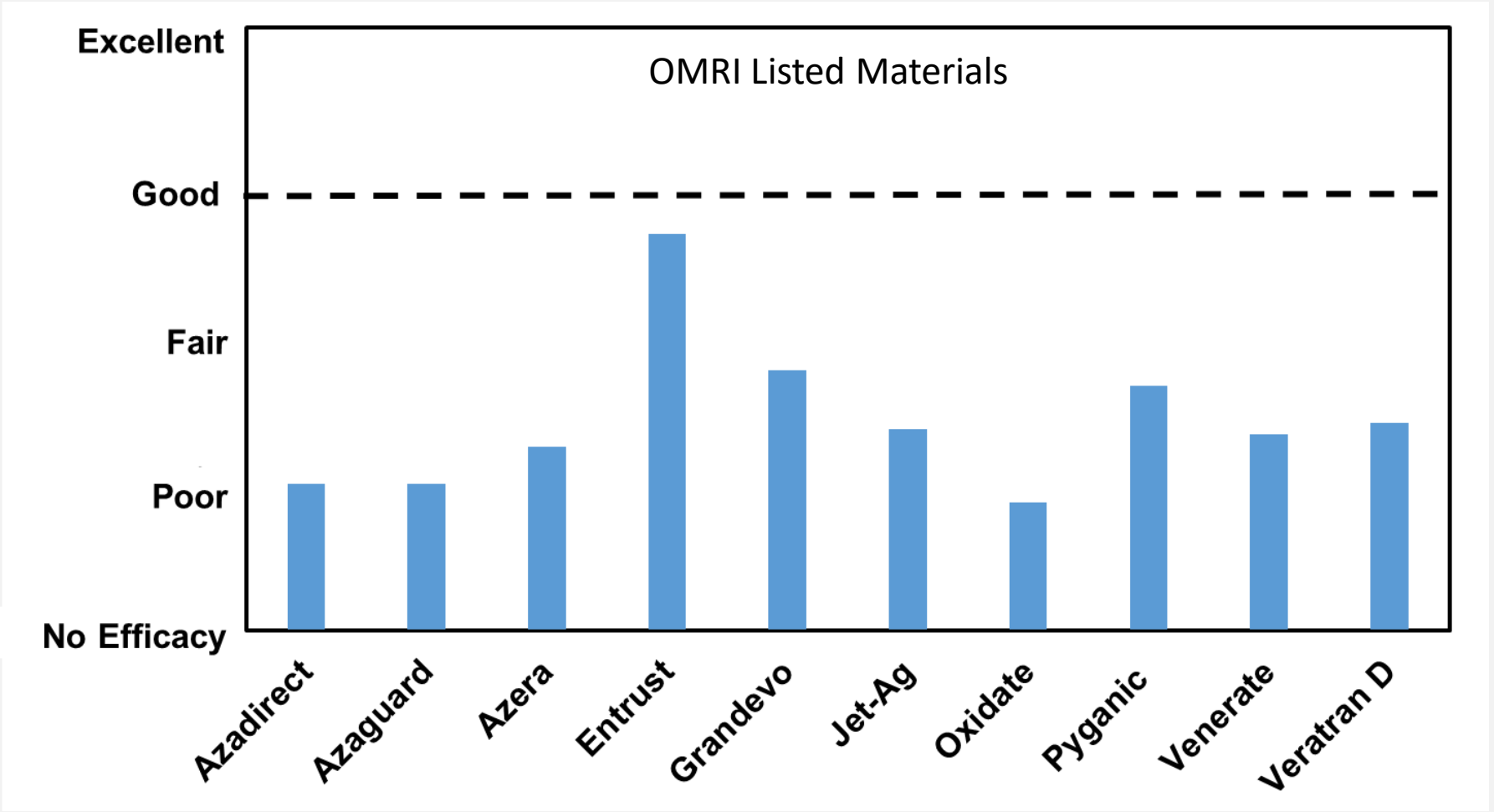

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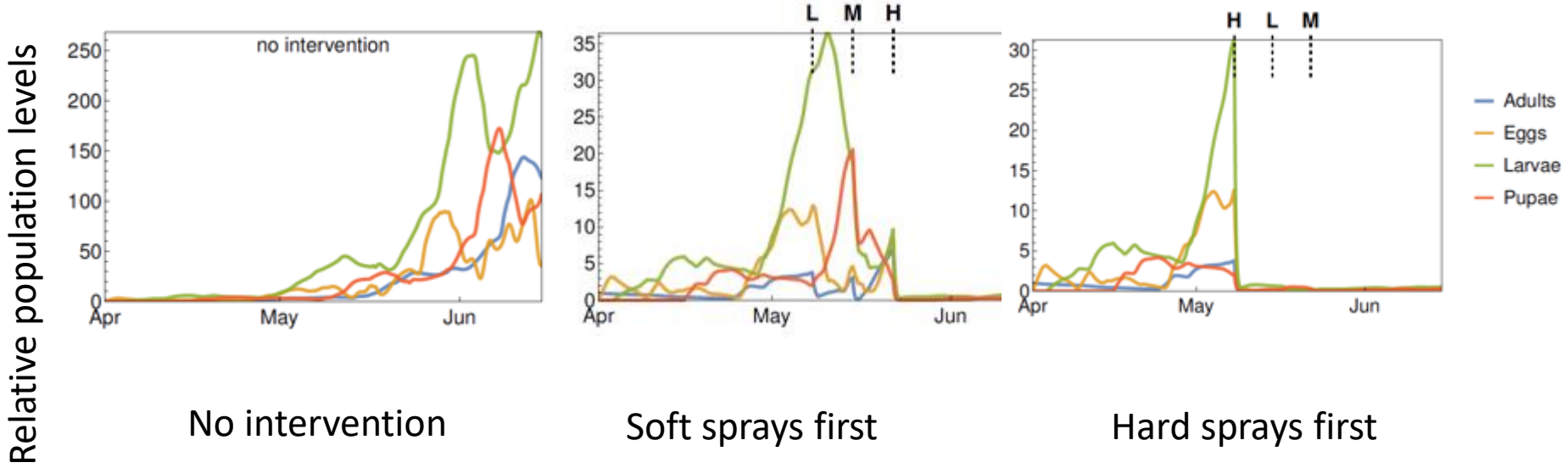
Season-long Management Programs

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, and Pyganic

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

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

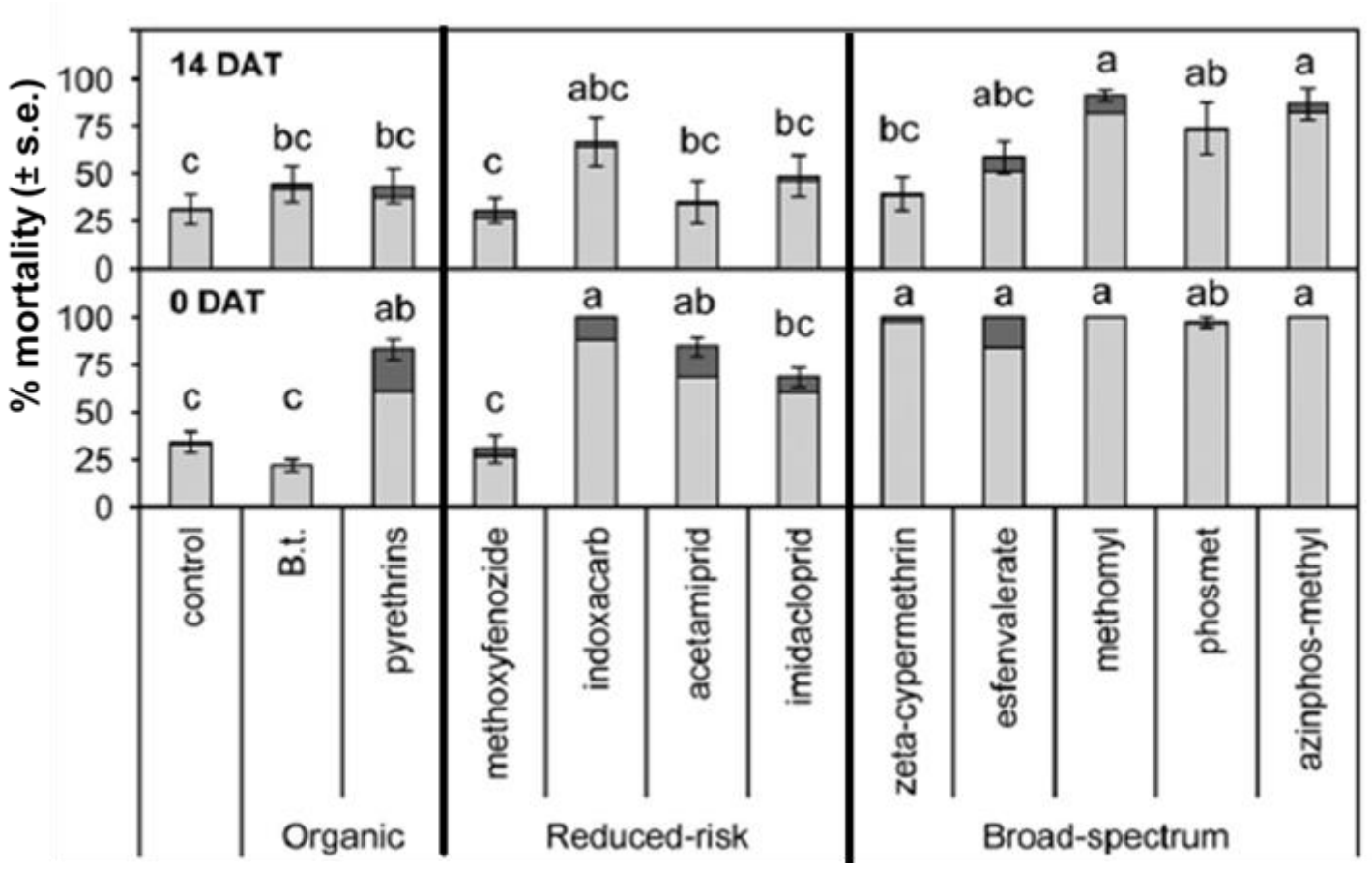


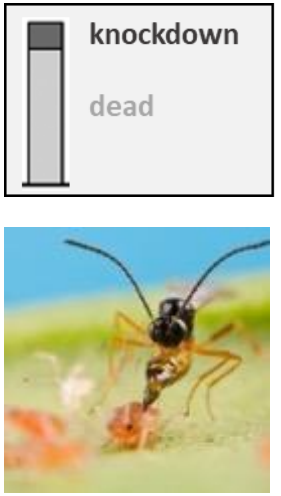
No intervention | Soft sprays first | Hard sprays first

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

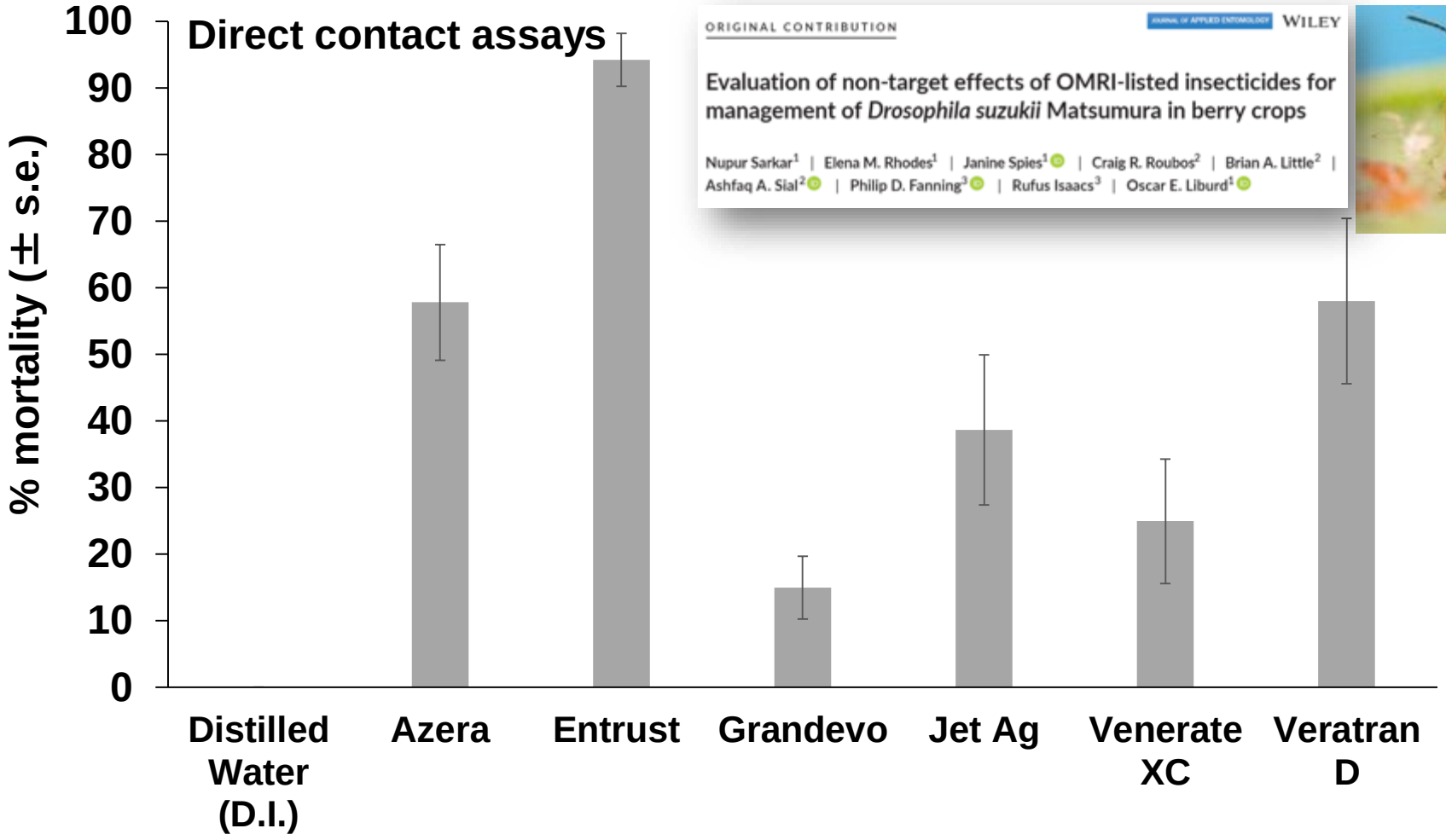
Insecticide effects on parasitoid wasp





Roubos et al. 2014

What about organic insecticides?



ORIGINAL CONTRIBUTION

JOURNAL OF APPLIED ENTOMOLOGY WILEY

Evaluation of non-target effects of OMRI-listed insecticides for management of *Drosophila suzukii* Matsumura in berry crops

Nupur Sarkar[1] | Elena M. Rhodes[1] | Janine Spies[1] | Craig R. Roubos[2] | Brian A. Little[2] | Ashfaq A. Sial[2] | Philip D. Fanning[3] | Rufus Isaacs[3] | Oscar E. Liburd[1]

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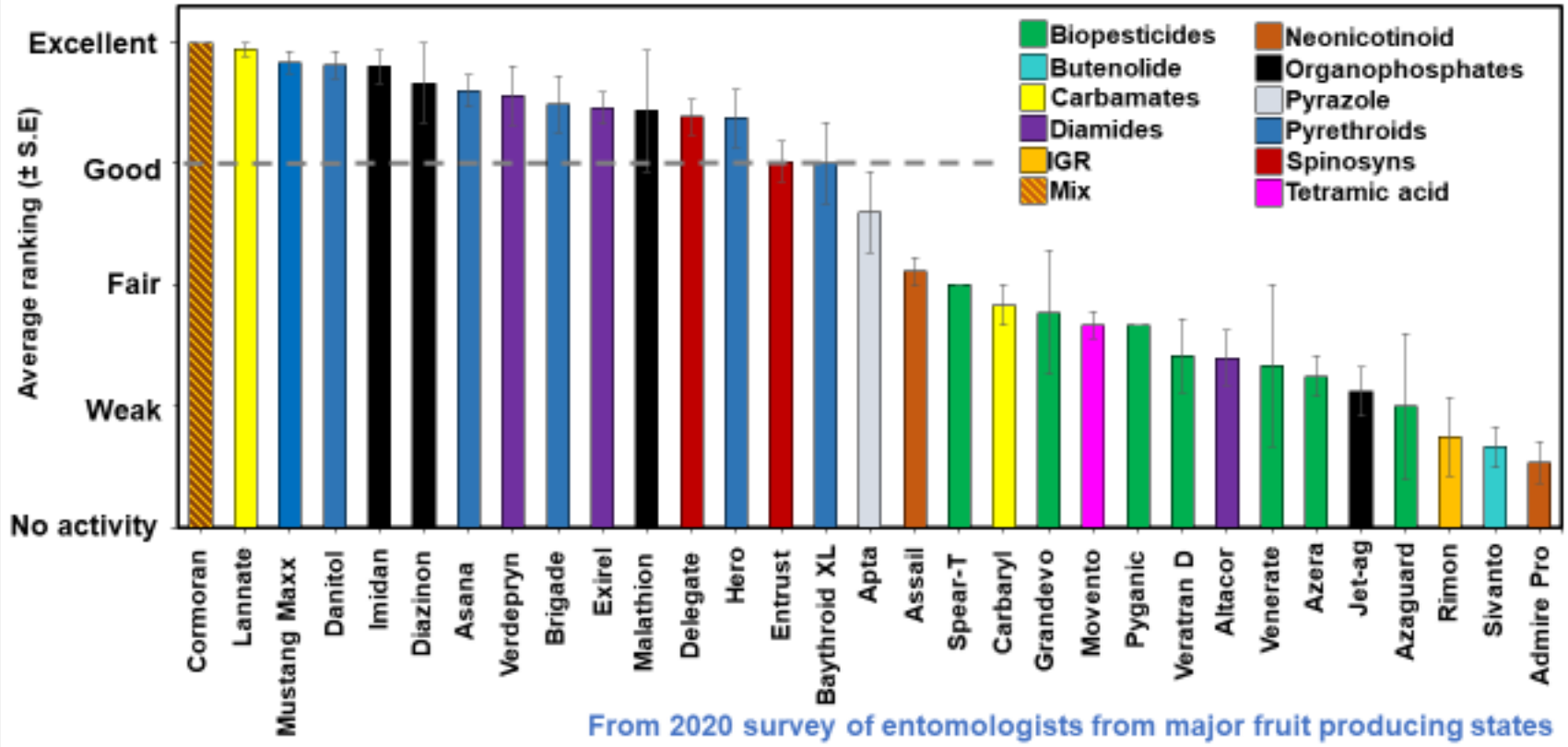
Season-long Management Programs

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: df, F, *p*		2:185, 89.39, <.0001	2:92, 143.334, <.0001	2:48, 9.932, 0.0002
Nu Film P: df, F, *p*		1:185, 0.147, 0.372	1:92, 0.003, 0.956	

2020 summary rankings of insecticide efficacy against SWD

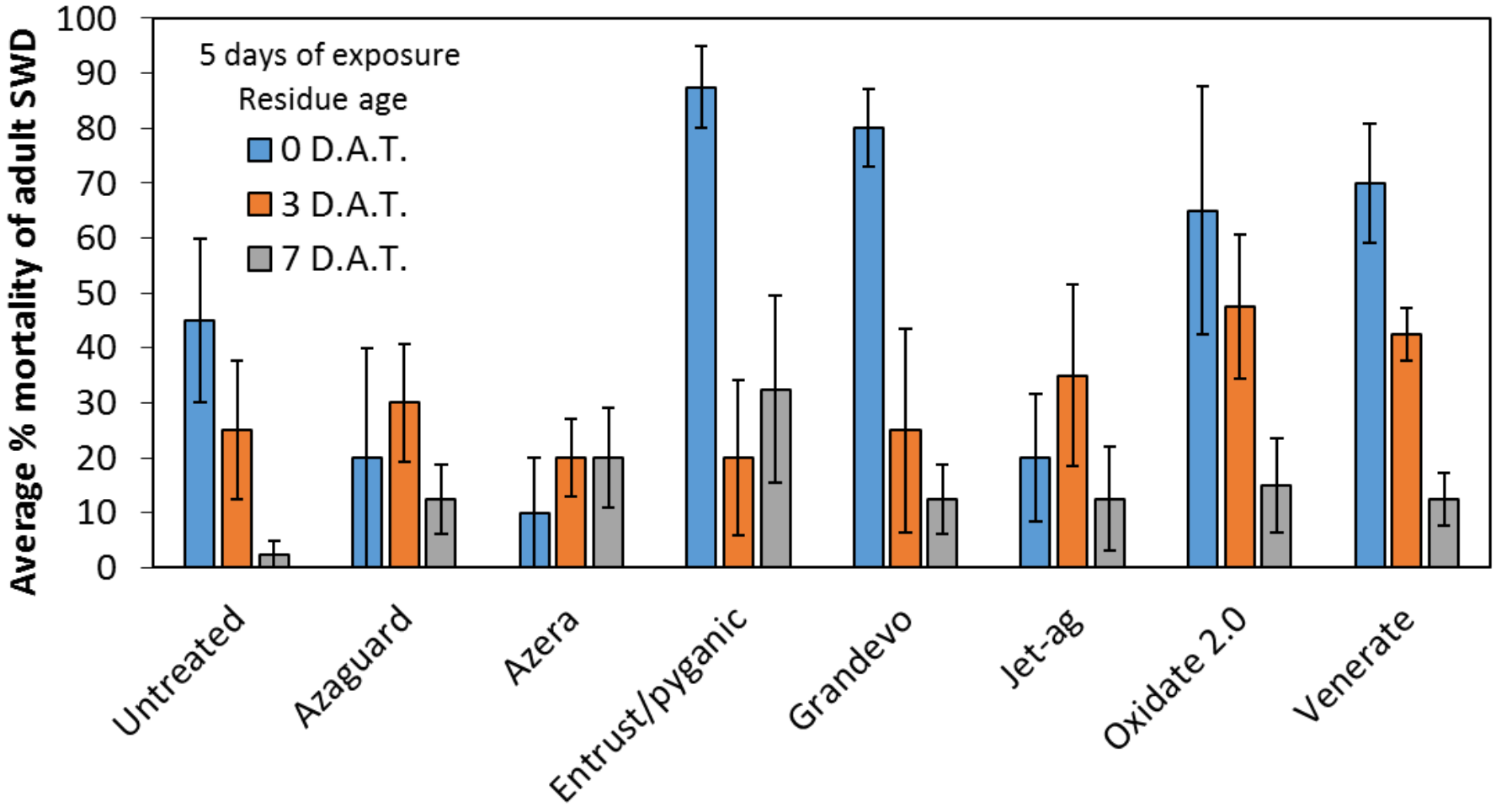
9 states, 19 state x crop combinations
CA, OR, WA, MI, ME, NY, NJ, NC, GA, FL



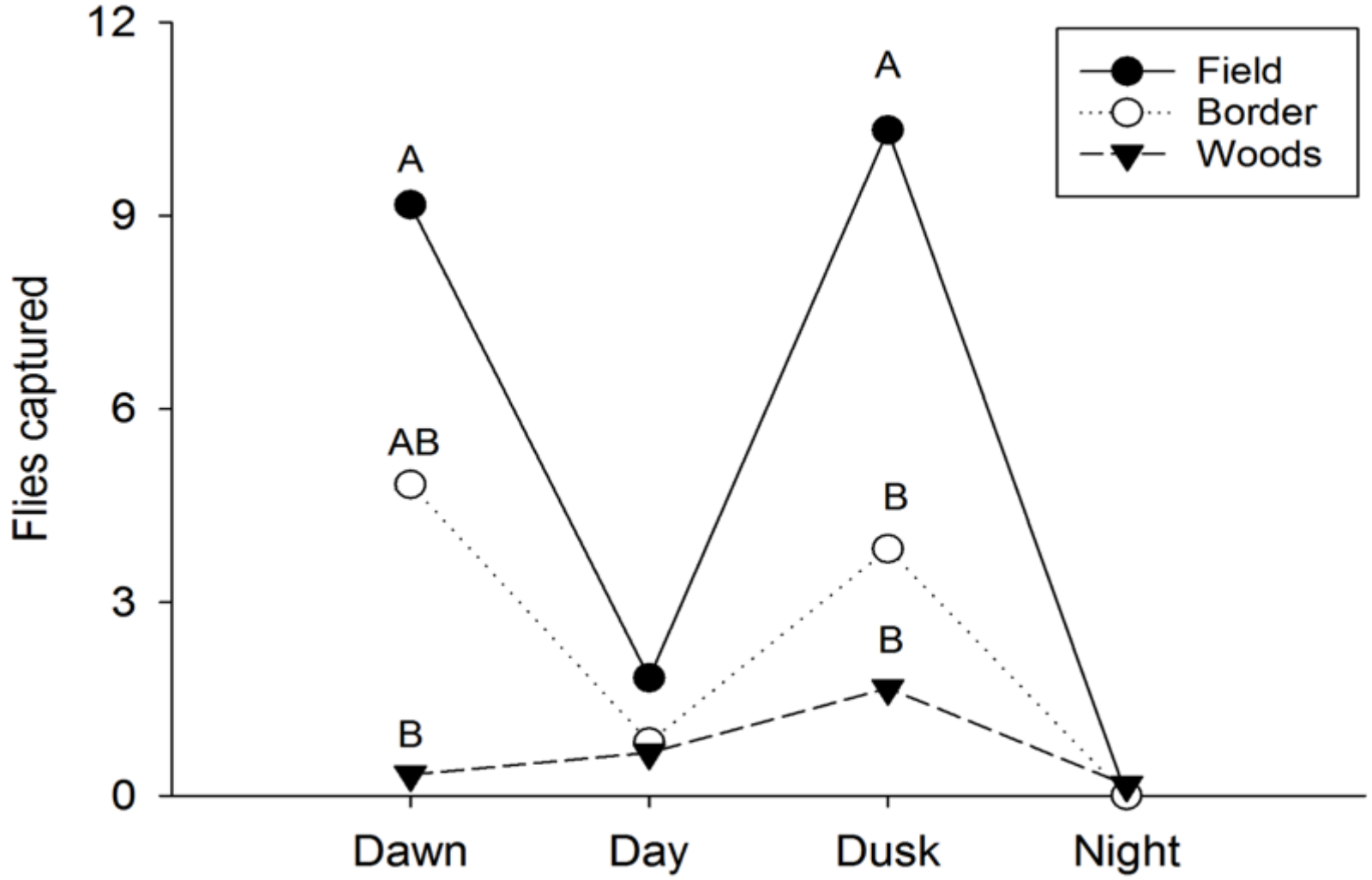
Efficacy of Organic Insecticides in Blueberries

	Trade name	Field rate (maximum)	5 gal water
1	Entrust SC	6 fl oz/acre	17.7 ml
2	PyGanic EC 1.4	64 fl oz/acre	189.3 ml
3	Venerate XC	8 qrts/acre	757 ml
4	Azera	3.5 pints/acre	165.6 ml
5	OxiDate 2.0	128 fl oz/100 gal water	189.3 ml
6	Jet-Ag	1 gal/100 gal water	189.3 ml
7	AzaGuard	16 fl oz/acre	47.3 ml
8	Grandevo	3 lbs/acre	136 g

Efficacy of Organic Insecticides in Blueberries

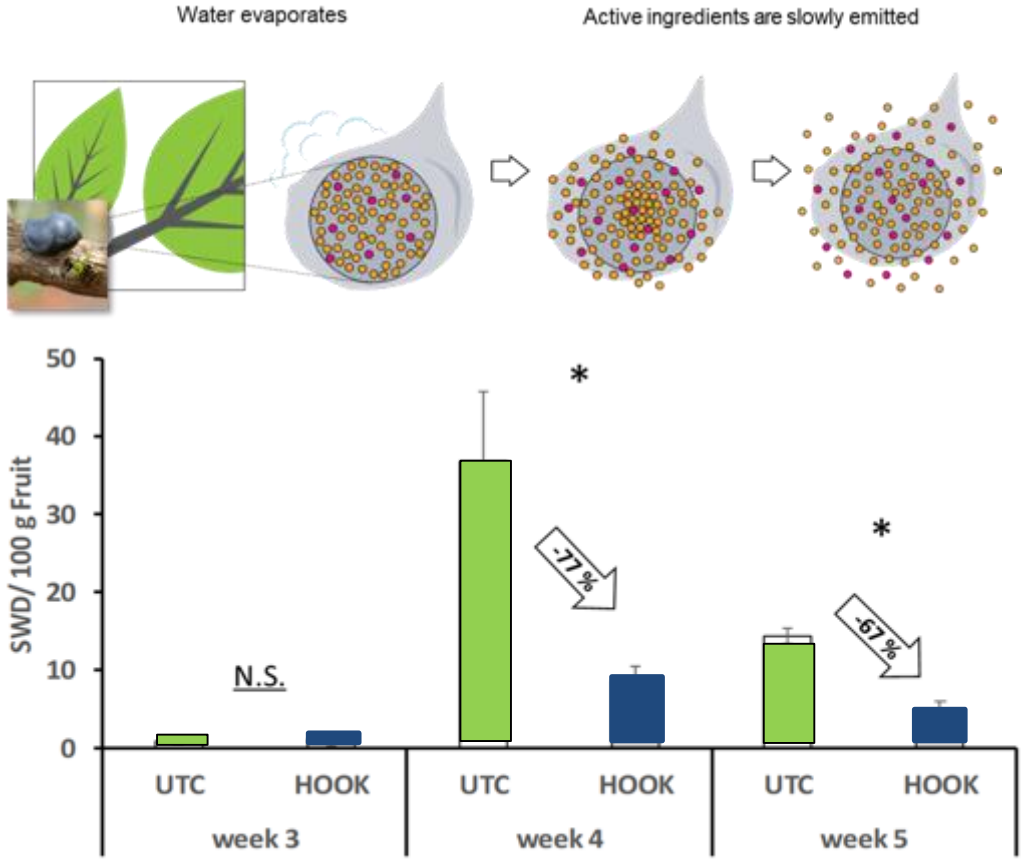


SWD Activity in the Field

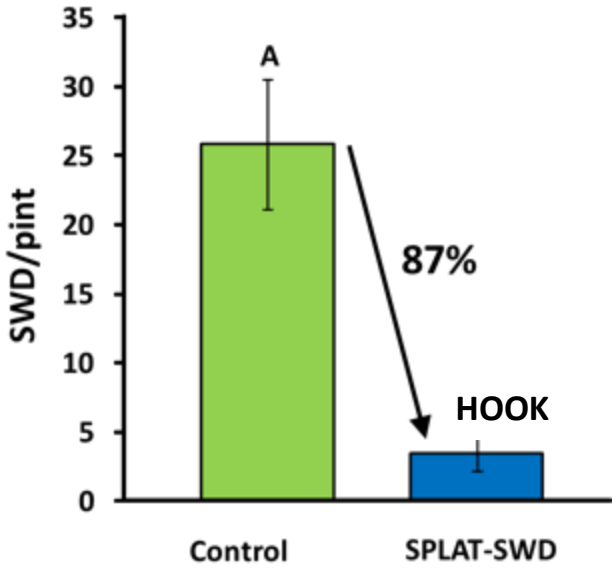


Behavioral Control Strategies

A slow-release "attract-and-kill" formulation (SPLAT/HOOK SWD) shows promise under field conditions.



* Significantly different, ANOVA, Fisher LSD (p<.05)



Klick et al. *J. Insect Science*. **2019**

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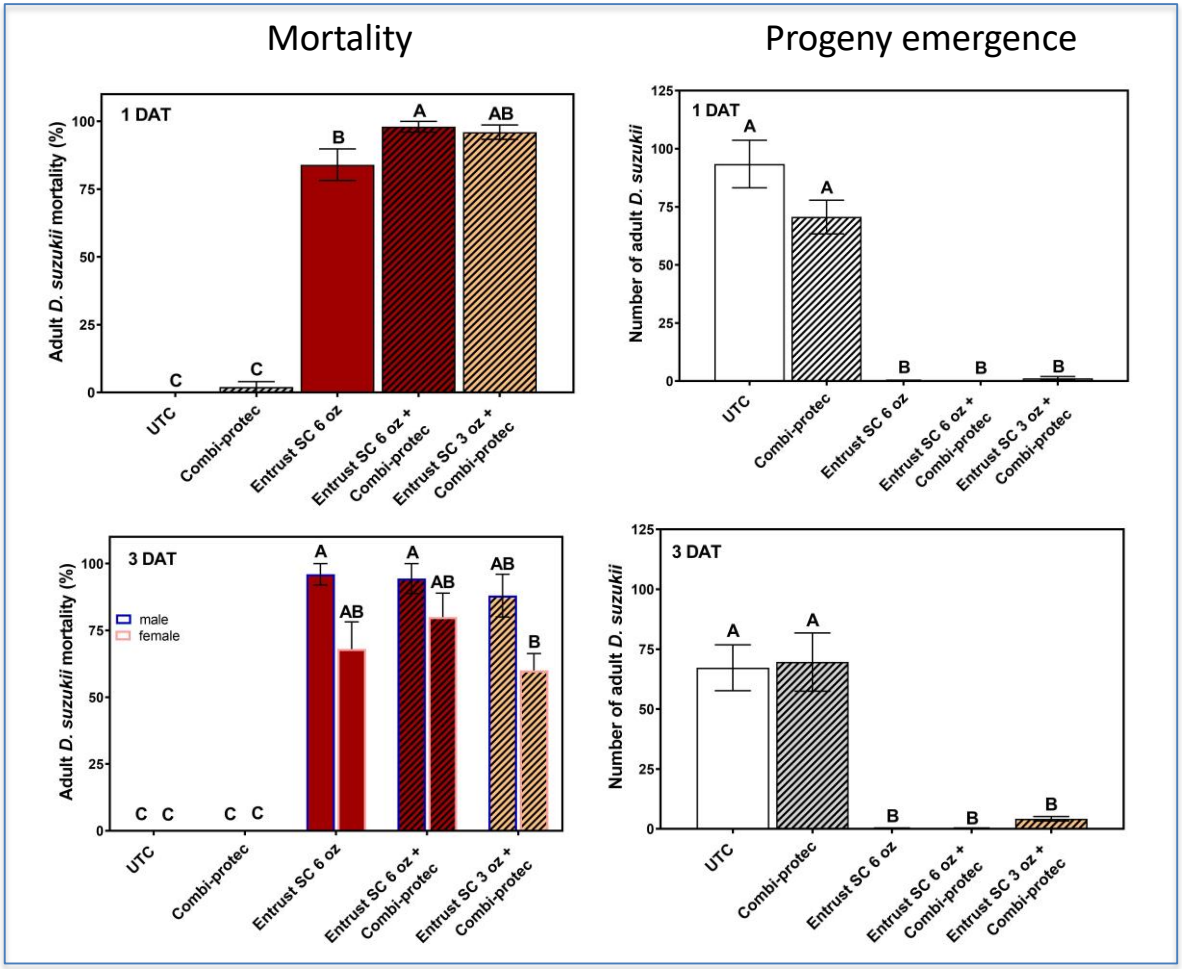
Combi-protec as a novel adjuvant for SWD chemical management

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

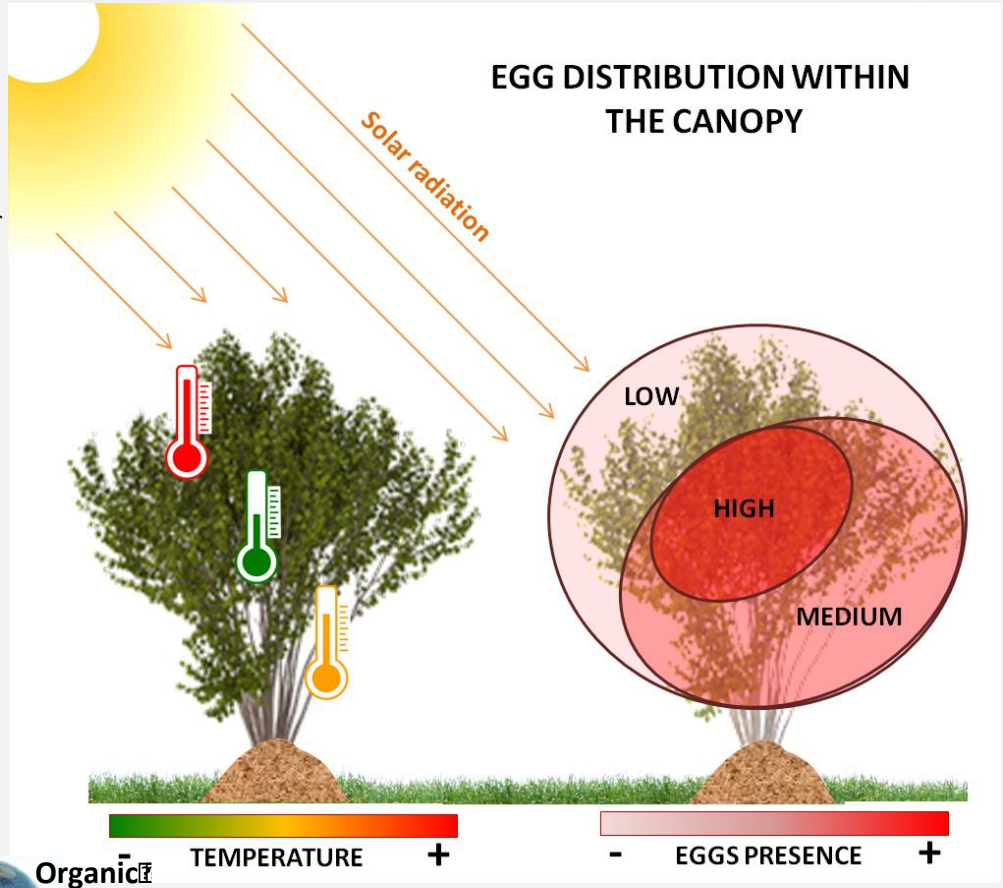


Illustration: Marco Rossi-Stacconi, © OSU

TEMPERATURE

Don't survive at constant temp >87.6° F; No egg laying at 95° 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

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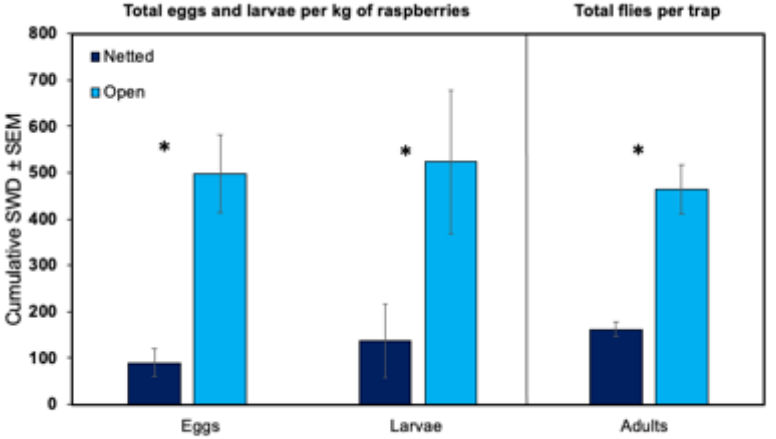
Physical Exclusion

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

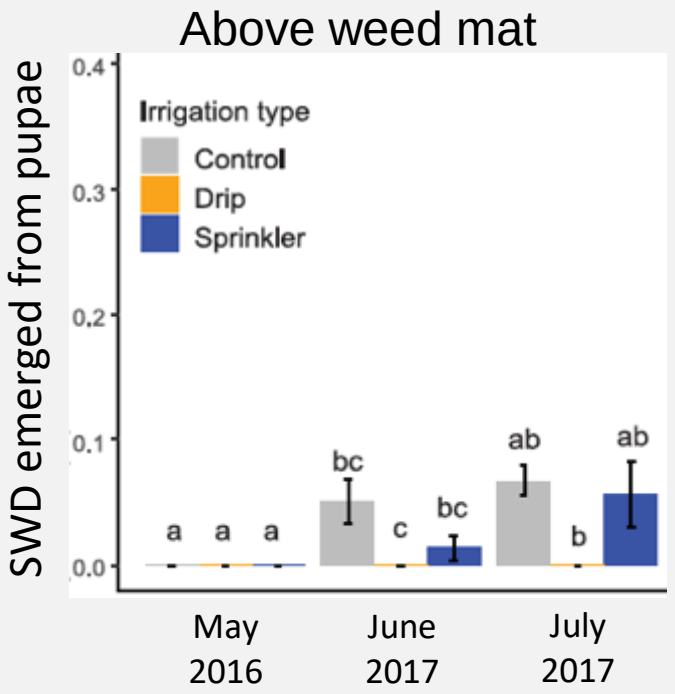


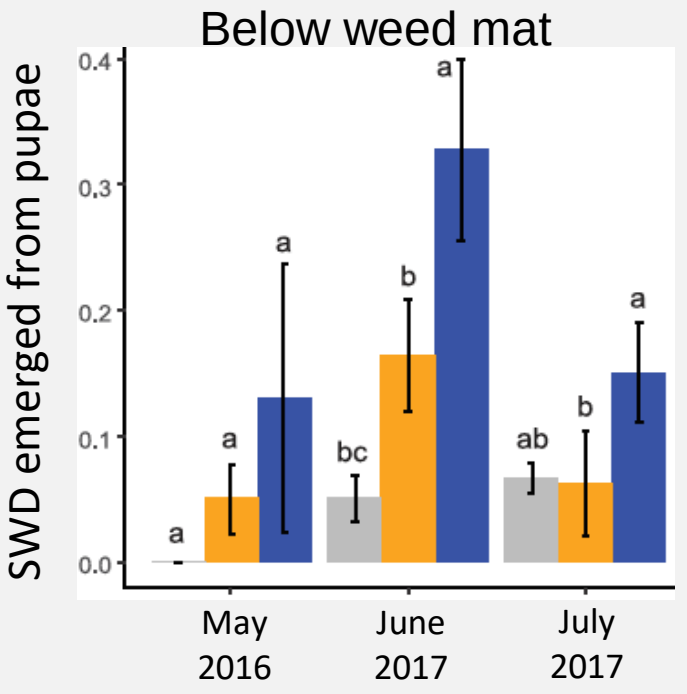
Leach et al. 2016. Exclusion netting delays and reduces *Drosophila suzukii* (Diptera: Drosophilidae) infestation in raspberries

Organic SWD Management

Irrigation

Exclusion trials: OR





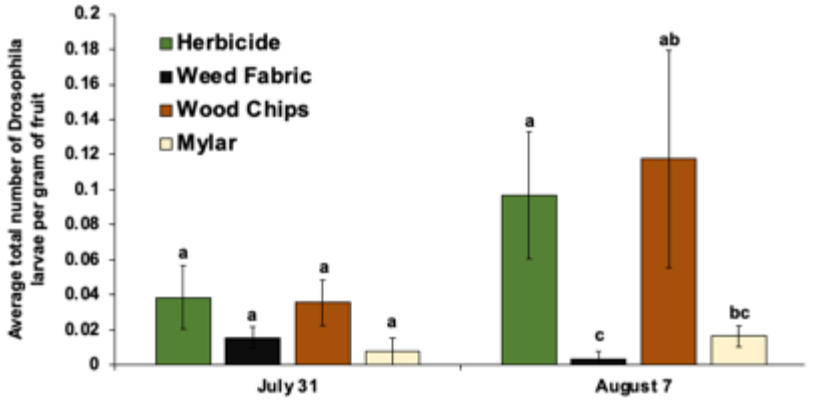
- Drip irrigation reduces relative humidity

Organic SWD Management

University of Georgia | Oregon State University | Michigan State University | University of Minnesota | UC Davis University of California | Rutgers | UF University of Florida | Berkeley University of California | University of Maryland | NC State University | University of Arkansas | USDA ARS

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


Research Article

Mulching as a cultural control strategy for *Drosophila suzukii* in blueberry

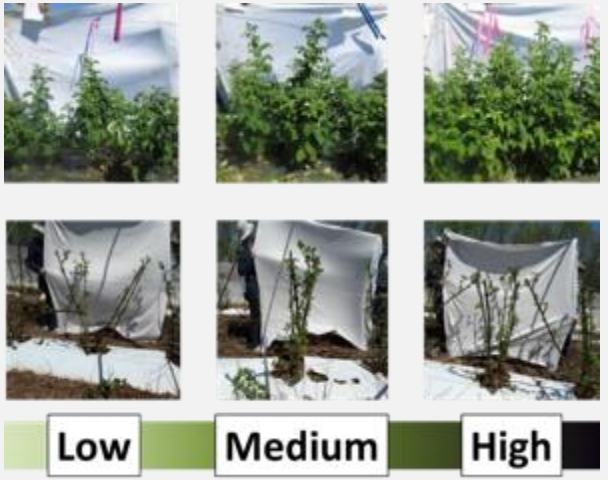
Rendon et al. 2019 *Pest Manag. Sci.*

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

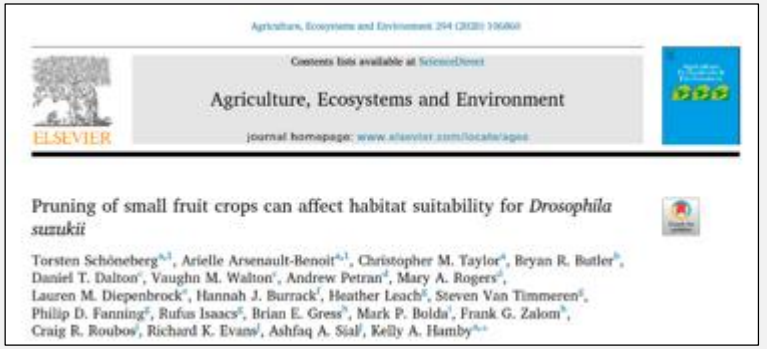
Canopy Density



Light Pruning

Medium Pruning

Heavy Pruning



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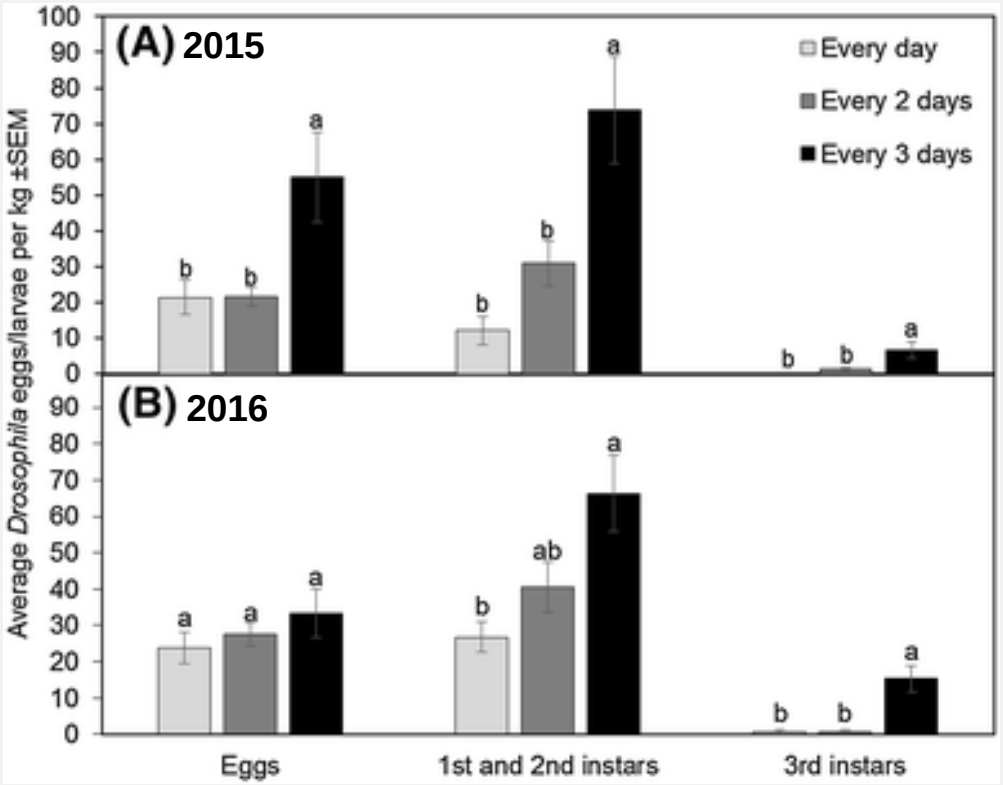
Pruning of small fruit crops can affect habitat suitability for *Drosophila suzukii*

Torsten Schöneberg[a,1], Arielle Arsenault-Benoit[a,1], Christopher M. Taylor[a], Bryan R. Butler[b], Daniel T. Dalton[c], Vaughn M. Walton[c], Andrew Petran[d], Mary A. Rogers[e], Lauren M. Diepenbrock[a], Hannah J. Burrack[f], Heather Leach[g], Steven Van Timmeren[g], Philip D. Fanning[g], Rufus Isaacs[g], Brian E. Gress[h], Mark P. Bolda[i], Frank G. Zalom[h], Craig R. Roubos[j], Richard K. Evans[j], Ashfaq A. Sial[j], Kelly A. Hamby[a,*]

Organic SWD Management

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 ≥ 2 ft deep

Postharvest Cold Storage

0° C = 32° F
2.2° C = 36° F
20° C = 68° 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**
Insect Pests (Insecticides/ Management options)	**Bagworms** (Remove and dispose of canes) **Scale Insects** (Horticultural/ Superior oil, Assail, Admire Pro, Sivanto, Knack, Movento) **Red imported fire ants** (Esteem Ant Bait, Extinguish Professional Fire Ant Bait) **Gall midge** (Assail, Delegate, Entrust, Diazinon)	**Gall Midge** (Assail, Delegate, Entrust, Diazinon) **Flower Thrips** (Delegate, Entrust, Assail)	**Flower Thrips** (Delegate, Entrust, Assail)	**Cranberry and Cherry Fruitworms** (Altacor, Verdepryn, Avaunt, Intrepid, Rimon, Assail, Delegate, Entrust, Confirm, Grandevo, Pyganic, Venerate) **Sharpnosed Glassy-winged Sharpshooter, and other Leafhoppers** (Assail, Admire Pro, Actara, Asana, Movento) **Plum Curculio** (Imidan, Avaunt, Actara, Sniper, Altacor, Asana, Danitol, Surround)	**Sharpnosed Glassy-winged Sharpshooter, and other Leafhoppers** (Assail, Admire Pro, Actara, Asana, Movento) **Periodical Cicadas** (0.25-inch Mesh Netting) **Flea Beetle** (Sevin, Assail, Admire Pro, Actara, Entrust, Delegate) **Japanese Beetle** (Imidan, Admire Pro, Assail, Sevin, Asana, Neemix + Trilogy)	**Blueberry Stem Borer** (Prune & destroy all infested and wilted canes) **Blueberry Maggot** (Brigade, Sniper, Imidan, Assail, Admire Pro, Delegate, Verdepryn, Malathion, Movento, Danitol, Mustang Maxx) **Spotted-wing Drosophila** (Imidan, Danitol, Brigade, Sniper, Mustang Maxx, Delegate, Lannate, Exirel, Verdepryn, Malathion, Cormoran, Entrust, Spear-T, Grandevo, Pyganic, Venerate, Jet-Ag) **Yellownecked Caterpillar, Spanworms, Azalea Caterpillar, Red Humped Caterpillar** (Dipel DF, Altacor, Asana, Adjourn)	**Sharpnosed Glassy-winged sharpshooter, and other leafhoppers** (Assail, Admire Pro, Actara, Asana, Movento) **Blueberry Bud Mite** (Variety selection, summer hedging, Horticultural/ Superior oil, Portal) **Chilli Thrips** (Assail, Delegate, Admire Pro, Entrust, Sivanto Prime, Movento) **Scale Insects** (Horticultural/ Superior oil, Assail, Admire Pro, Sivanto, Knack, Movento)

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
- ✓ Majority of SWD activity in the field occurs during dawn and dusk, and making insecticide applications during these times will result in much better control of SWD

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 effectives against budmites and scales
  - ✓ Other insecticides including 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
- ✓ Permit to release exotic SWD parasitoids has been approved. We'll start field evaluation this year
- ✓ Further research on behavioral control technologies also ongoing and we'll keep you updated on the progress

SUMMARY

- ✓ Do not apply oil during periods of high temperatures
- ✓ Do not spray immediately before, during, or following cold weather or freezing temperatures b/c effectiveness is reduced at temperature below $50^{o}F$
- ✓ Do not use within 14 days of lime-sulfur, captan, chlorothalonil, and dimethoate.
- ✓ Dormant oil applications exacerbate Exobasidium
- ✓ Current recommendations are to make oil applications as early in the dormant period as possible to allow as long as possible between oil and sulfur applications.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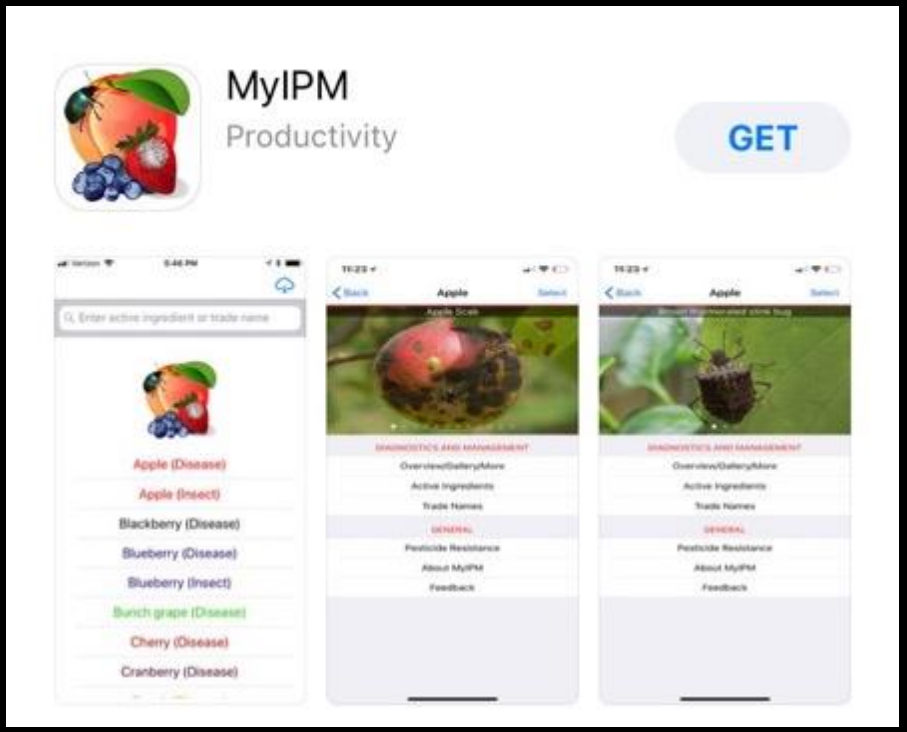
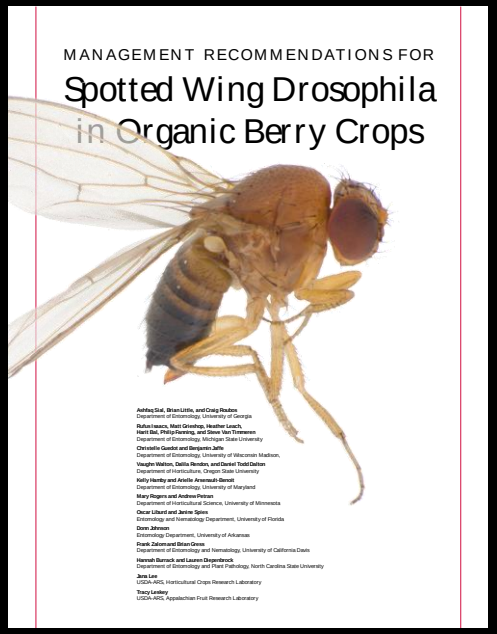
2024
Southeast Regional Blueberry
INTEGRATED PEST MANAGEMENT GUIDE


MyIPM
Productivity
GET
Apple (Disease)
Apple (Insect)
Blackberry (Disease)
Blueberry (Disease)
Blueberry (Insect)
Bunch grape (Disease)
Cherry (Disease)
Cranberry (Disease)


MANAGEMENT RECOMMENDATIONS FOR
Spotted Wing Drosophila
in Organic Berry Crops


UGA Blueberry Blog |
A blog from the College of Agricultural and Environmental Sciences at UGA.
UGA BLUEBERRY BLOG
Scientific Information That Matters
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23
Current Season Winter Chilling: What's Going On ???
Written by Ash Sial
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Blueberry Rust Alert
Mummy Berry Fungicide Application

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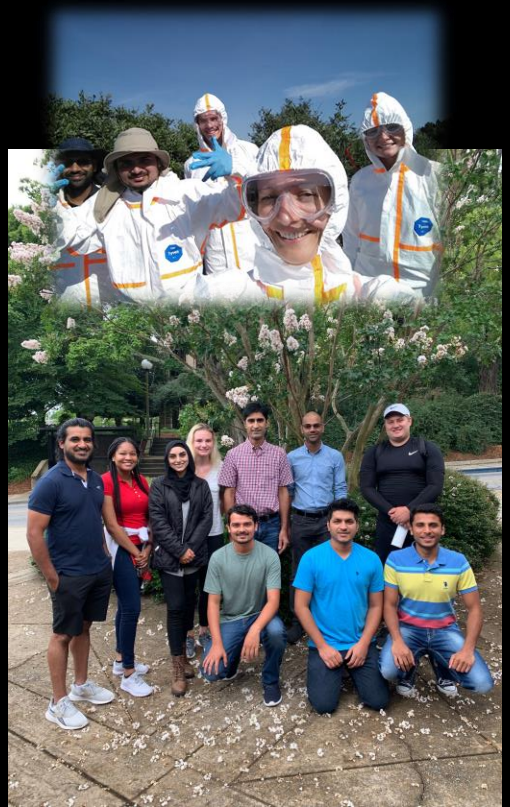
- ✓ Georgia Berry Exchange
- ✓ Blueberry Commodity Commission
- ✓ Georgia Department of Ag
- ✓ Southern Regional IPM Center
- ✓ Private Industry Collaborators
- ✓ MBG



USDA NIFA

United States Department of Agriculture
National Institute of Food and Agriculture

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National Survey to Determine Status of SWD

A national team of researchers is conducting a survey to determine status of SWD research and its impact SWD management. The survey will take only 15 minutes to complete. Data collected will be confidential and will advance research efforts focused on developing more effective and efficient SWD management tools to meet your needs. We really appreciate your help in completing this survey. Thank you!

https://ufl.qualtrics.com/jfe/form/SV_9B5kHcjLIRgW9gO