Insecticide rotations for thrips management in Florida strawberry

Justin Renkema, Shashan Devkota, Babu Panthi, Oscar Liburd, Joe Funderburk

UF IFAS UNIVERSITY of FLORIDA

UF/IFAS GULF COAST RESEARCH & EDUCATION CENTER

A new invasive pest: chilli thrips (*Scirtothrips dorsalis*)

- Invasive (Florida 2005)
- > 100 host plants
- Early-season, warm temperatures
- Foliar damage to young plants
  - Darkening of veins & petioles
  - Wrinkling & shriveling
- Fruit damage
  - Cracked, bronzed, small

Perennial pests: flower thrips (*Frankliniella* spp.)

F. bispinosa **Florida flower thrips**

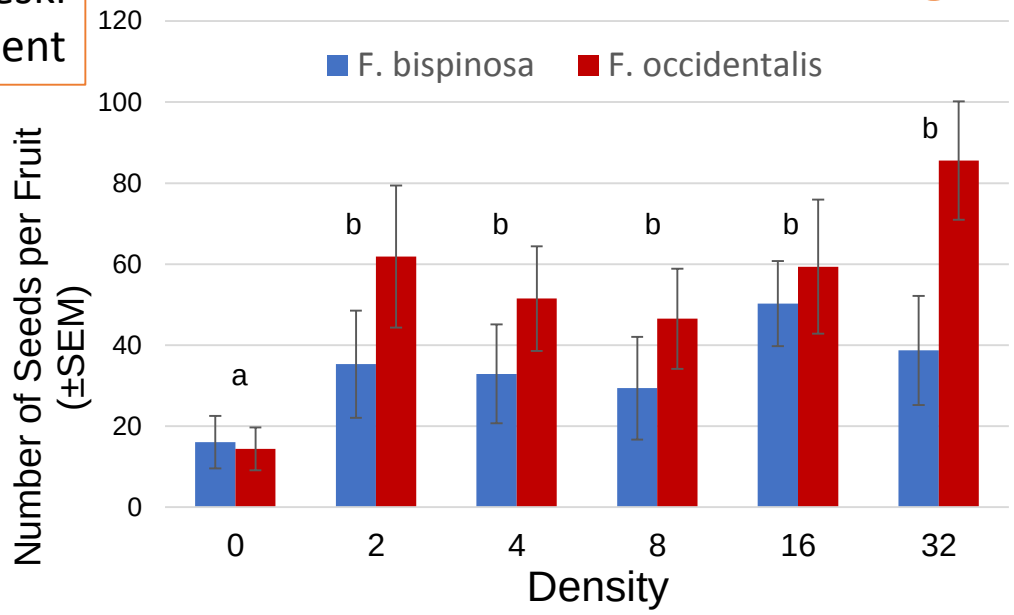
- Common, native, less damage, not resistant

F. occidentalis **Western flower thrips**

- Uncommon, invasive, more damage, develop resistance
- Throughout the season
- Flower & fruit damage

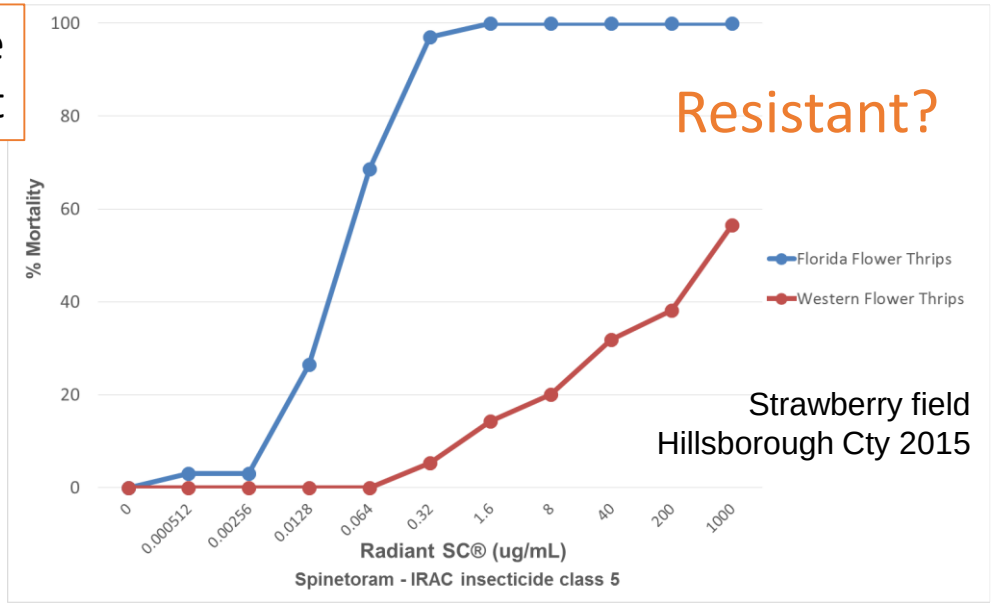
Iris Strzyzweski
MS student

How much damage?



Danielle Sprague
MS student

Resistant?



Strawberry field
Hillsborough Cty 2015

Insecticide tools for thrips management in strawberry

Radiant SC (spinetoram)
Group 5
highly effective

39 oz/A/season
6-10 oz/A/appl.
Recommend:
2 appl/season
Max. 3 appl/season

VoliamFlexi
(thiamethoxam + chlorantraniliprole)
Group 4A + 28
effective

Apta (tolfenpyrad)
Group 21A
effective

Exirel (cyantraniliprole)
Group 28
effective

Rimon 0.83 EC (novaluron)
Group 15
effective against larvae

Minecto Pro
(abamectin + cyantraniliprole)
Group 6 + 28
effective

Sivanto (flupyradifurone)
Group 4D
moderately effective

Assail 30 SG (acetamiprid)
Group 4A
effective

Closer (sulfoxaflor)
Group 4C
effective

Objective:

Test season-long (2016-2017 & 2017-2018) insecticide rotations for control of multiple thrips species in strawberries

- Efficacy of new products
- Efficacy of OMRI-listed products
- Effectiveness of fewer overall applications

Methods:

- Bare-root 'Radiance' planted October 6, 2016 & October 9, 2017
- 10 m × 1 bed (2 row) plots
- CO_2-pressurized sprayer and handheld wand with two nozzles

Product rotations – 2016-2017

	1	2	3	4	7	5	6	8	9
17 Nov	Voliam Flexi	Voliam Flexi	Voliam Flexi						
2 Dec	Radiant	Radiant	Radiant	Radiant	Grandevo	Apta	Exirel	Minecto Pro	Radiant
5 Dec	Rimon								
20 Dec	Assail	Assail	Sivanto	Assail	Radiant	Apta	Exirel	Minecto Pro	Radiant
8 Feb	Radiant	Radiant	Assail	Trilogy	Grandevo	Apta	Exirel	Minecto Pro	Radiant
16 Feb	Rimon			Trilogy					
24 Feb	Assail	Beleaf	Malathion	Trilogy	Radiant	Apta	Exirel	Minecto Pro	Radiant
10 Mar	Radiant	Sivanto	Actara	Radiant	Venerate	Apta	Exirel	Minecto Pro	Radiant

Product rotations – 2016-2017

	1	2	3	4	7	5	6	8	9
17 Nov	Voliam Flexi	Voliam Flexi	Voliam Flexi						
2 Dec	Radiant	Radiant	Radiant	Radiant	Grandevo	Apta	Exirel	Minecto Pro	Radiant
5 Dec	Rimon								
20 Dec	Assail	Assail	Sivanto	Assail	Radiant	Apta	Exirel	Minecto Pro	Radiant
Chilli thrips on leaves 24 Nov +1+8+16 +27 Dec +3 Jan	2.25 B	2.5 B	4.0 B	6.0 B	10.5 B	5.5 B	6.0 B	5.75 B	5.0 B
					Control – 25.0 A				

Product rotations – 2016-2017

	1	2	3	4	7	5	6	8	9
17 Nov	Voliam Flexi	Voliam Flexi	Voliam Flexi						
2 Dec	Radiant	Radiant	Radiant	Radiant	Grandevo	Apta	Exirel	Minecto Pro	Radiant
5 Dec	Rimon								
20 Dec	Assail	Assail	Sivanto	Assail	Radiant	Apta	Exirel	Minecto Pro	Radiant
Chilli thrips **LARVAE** on leaves	0.0	2.0	1.75	4.25	7.25	3.25	5.25	5.0	2.5
	B	B	B	B	B	B	B	B	B
24 Nov +1+8+16 +27 Dec +3 Jan					Control – 18.75 A				

Product rotations – 2016-2017

	1	2	3	4	7	5	6	8	9
17 Nov	Voliam Flexi	Voliam Flexi	Voliam Flexi						
2 Dec	Radiant	Radiant	Radiant	Radiant	Grandevo	Apta	Exirel	Minecto Pro	Radiant
5 Dec	Rimon								
20 Dec	Assail	Assail	Sivanto	Assail	Radiant	Apta	Exirel	Minecto Pro	Radiant
Flower thrips **LARVAE** in flowers or green fruit	2.75 B	10.75 B	8.0 B	8.25 B	86.0 AB	22.25 AB	2.75 B	5.5 B	5.0 B
1+8+16+ 27 Dec +3 Jan					Control – 106.25 A				

Product rotations – 2016-2017

	1	2	3	4	7	5	6	8	9
17 Nov	Voliam Flexi	Voliam Flexi	Voliam Flexi						
2 Dec	Radiant	Radiant	Radiant	Radiant	Grandevo	Apta	Exirel	Minecto Pro	Radiant
5 Dec	Rimon								
20 Dec	Assail	Assail	Sivanto	Assail	Radiant	Apta	Exirel	Minecto Pro	Radiant
% berries with thrips damage	7.3	6.5	5.2	19.3	27.7	20.9	18.8	21.7	19.0
	C	C	C	B	AB	AB	B	AB	B
8+12+16 +20+28 Dec +2 Jan					Control – 31.1 A				

Product rotations –2017-2018

	8	9	4	5	6	7	10	11	1	2	3
7 Nov	Voliam Flexi	Voliam Flexi									
15 Nov	Radiant		Radiant	Exirel	Exirel	Sivanto	Azera/ Azera	Entrust/ Entrust	Radiant	Closer	Radiant
29 Nov		Radiant	Assail	Assail	Sivanto	Assail	Entrust/ Entrust	Venerate/ Venerate	Radiant	Closer	Closer
~~13 Dec~~	~~Assail~~			~~Radiant~~	~~Radiant~~	~~Exirel~~	Captiva Prime/ Captiva Prime	EcoTec Plus/ EcoTec Plus	~~Radiant~~	~~Closer~~	~~Radiant~~
Chilli thrips on leaves 14+21+ 28 Nov + 5 Dec	2.25 CD	9.0 BCD	0.5 D	7.0 BCD	3.75 BCD	14.75 AB	13.5 ABC	3.25 BCD	2.0 CD	9.25 BCD	2.25 CD
						Control – 25.5 A					

Product rotations –2017-2018

	8	9	4	5	6	7	10	11	1	2	3
7 Nov	Voliam Flexi	Voliam Flexi									
15 Nov	Radiant		Radiant	Exirel	Exirel	Sivanto	Azera/ Azera	Entrust/ Entrust	Radiant	Closer	Radiant
29 Nov		Radiant	Assail	Assail	Sivanto	Assail	Entrust/ Entrust	Venerate/ Venerate	Radiant	Closer	Closer
~~13 Dec~~	~~Assail~~			~~Radiant~~	~~Radiant~~	~~Exirel~~	Captiva Prime/ Captiva Prime	EcoTec Plus/ EcoTec Plus	~~Radiant~~	~~Closer~~	~~Radiant~~
Chilli thrips **LARVAE** on leaves 14+21+ 28 Nov + 5 Dec	1.75 C	6.75 BC	0.0 C	3.0 BC	3.0 BC	12.0 AB	10.5 ABC	3.0 BC	1.5 C	6.5 BC	1.25 C
						Control – 18.5 A					

Product rotations –2017-2018

	8	9	4	5	6	7	10	11	1	2	3
7 Nov	Voliam Flexi	Voliam Flexi									
15 Nov	Radiant		Radiant	Exirel	Exirel	Sivanto	Azera/ Azera	Entrust/ Entrust	Radiant	Closer	Radiant
29 Nov		Radiant	Assail	Assail	Sivanto	Assail	Entrust/ Entrust	Venerate/ Venerate	Radiant	Closer	Closer
13 Dec	Assail			Radiant	Radiant	Exirel	Captiva Prime/ Captiva Prime	EcoTec Plus/ EcoTec Plus	Radiant	Closer	Radiant
% berries with thrips damage 4+11+18 +26 Dec	10.9 B	13.8 AB	5.6 B	8.8 B	9.5 B	20.2 AB	16.7 AB	17.5 AB	9.3 B	17.3 AB	6.6 B
						Control – 25.8 A					

Product rotations – 2016-2017

	1	2	3	4	7	5	6	8	9
17 Nov	Voliam Flexi	Voliam Flexi	Voliam Flexi						
2 Dec	Radiant	Radiant	Radiant	Radiant	Grandevo	Apta	Exirel	Minecto Pro	Radiant
5 Dec	Rimon								
20 Dec	Assail	Assail	Sivanto	Assail	Radiant	Apta	Exirel	Minecto Pro	Radiant
8 Feb	Radiant	Radiant	Assail	Trilogy	Grandevo	Apta	Exirel	Minecto Pro	Radiant
16 Feb	Rimon			Trilogy					
24 Feb	Assail	Beleaf	Malathion	Trilogy	Radiant	Apta	Exirel	Minecto Pro	Radiant
10 Mar	Radiant	Sivanto	Actara	Radiant	Venerate	Apta	Exirel	Minecto Pro	Radiant

Product rotations – 2016-2017

	1	2	3	4	7	5	6	8	9
Flower thrips **LARVAE** in flowers or green fruit	15.25 BC	31.75 ABC	43.0 ABC	69.5 A	54.5 AB	51.0 AB	7.0 C	15.75 BC	16.25 BC
14+22 Feb + 2+9+16+ 24 Mar				Control – 63.0 A					
8 Feb	Radiant	Radiant	Assail	Trilogy	Grandevo	Apta	Exirel	Minecto Pro	Radiant
16 Feb	Rimon			Trilogy					
24 Feb	Assail	Beleaf	Malathion	Trilogy	Radiant	Apta	Exirel	Minecto Pro	Radiant
10 Mar	Radiant	Sivanto	Actara	Radiant	Venerate	Apta	Exirel	Minecto Pro	Radiant

Product rotations – 2016-2017

	1	2	3	4	7	5	6	8	9
% berries with thrips damage	0.5	1.4	6.5	7.5	1.4	3.5	4.4	0.9	0.6
	B	B	B	B	B	B	B	B	B
17+21+27 Feb + 2+9+13+ 16 Mar				Control – 39.7 A					
8 Feb	Radiant	Radiant	Assail	Trilogy	Grandevo	Apta	Exirel	Minecto Pro	Radiant
16 Feb	Rimon			Trilogy					
24 Feb	Assail	Beleaf	Malathion	Trilogy	Radiant	Apta	Exirel	Minecto Pro	Radiant
10 Mar	Radiant	Sivanto	Actara	Radiant	Venerate	Apta	Exirel	Minecto Pro	Radiant

Conclusions

VoliamFlexi

(thiamethoxam + chlorantraniliprole)

Group 4A + 28

effective

2016-2017 (Compare rotations 2 and 4):

- 1/2 as many chilli thrips
- 1/3 as many thrips-damaged berries
- Small reduction in flower thrips

2017-2018

- Radiant followed by Assail more effective than Voliam Flexi followed by Radiant

Conclusions

Rimon 0.83 EC (novaluron)

Group 15

effective against larvae

2016-2017 (Compare rotations 1 and 2)

Early season:

- Slightly fewer chilli thrips
- No chilli thrips larvae
- ¼ as many flower thrips larvae
- No difference in % thrips-damaged berries

Late Season:

- Fewest flower thrips larvae
- Other insecticide rotations had similarly low % thrips-damaged berries

Conclusions

Radiant SC (spinetoram)
Group 5
highly effective

?
=

Exirel (cyantraniliprole)
Group 28
effective

2016-2017 (Compare rotations 6 and 9)
Early Season:

- Fewer chilli thrips with Radiant
- Fewer flower thrips with Exirel
- No difference in % thrips-damaged berries

Late Season:

- Fewer flower thrips with Exirel
- Fewer thrips-damaged berries with Radiant

2017-2018 (Compare rotations 4 and 5)
(each followed by Assail)
Early Season:

- Fewer chilli thrips with Radiant
- 3.2% fewer thrips-damaged berries with Radiant

Conclusions

Assail 30 SG (acetamiprid)
Group 4A
effective

?
=

Sivanto (flupyradifurone)
Group 4D
moderately effective

2016-2017 (Compare rotations 2 and 3)
Early Season:

- Small differences in chilli thrips
- Small differences in flower thrips larvae
- Small differences in % thrips-damaged berries

2017-2018 (Compare rotations 5 and 6)
(each preceded by Exirel)
Early Season:

- Small or no differences in chilli thrips
- Small differences in % thrips-damaged berries

Conclusions

Apta (tolfenpyrad)

Group 21A

effective

2016-2017 (Compare rotations 5 and 9)

Early Season:

- Small differences in chilli thrips
- 4-5X more flower thrips larvae (also in late season)
- Small differences in % thrips-damaged berries

Minecto Pro

(abamectin + cyantraniliprole)

Group 6 + 28

effective

2016-2017 (Compare rotations 8 and 9)

Early Season:

- Small differences in chilli thrips
- Small differences in flower thrips larvae
- Small differences in % thrips-damaged berries

Closer (sulfoxaflor)

Group 4C

effective

2017-2018 (Compare rotations 1 and 2)

Early Season:

- 4-5X more chilli thrips
- 2X as many thrips-damaged berries

Conclusions – OMRI listed products

Entrust + Venerate

~~Azera + Entrust~~

Trilogy

(neem oil)

Grandevo

2017-2018 (Compare rotations 11 and 1)

Early Season:

- Small differences in chilli thrips numbers
- Almost 2X as many thrips-damaged berries

2016-2017 (rotation 4)

Late Season (3 apps. followed by Radiant):

- Not effective at reducing flower thrips
- Significant reduction in % thrips damaged berries compared to control

2016-2017 (rotation 7)

Late & Early Season

- Not very effective when used before Radiant

Conclusions

1) Scout frequently for thrips and thrips-related damage

Chilli thrips: darkening of petioles and veins of new leaves

Flower thrips: adults and larvae in open flowers

Both: fruit bronzing

2) Early season management is necessary for chilli thrips

Voliam Flexi is effective

Replace a Radiant application with an Exirel application

Replace an Assail application with a Sivanto application

Entrust is effective

Acknowledgments

Marc Santos
Ryan Batts
Deb Farr
Karol Krey
Darsy Smith
Lexi Sanchez
Braden Evans
Iris Strzyzewski
Michael Hull
Phanie Bonneau
Rosa Ynfante

Florida Strawberry Growers Association

Specialty Crop Block Grant Program

Dow AgroSciences
Bayer Crop Science
DuPont Crop Protection
Nichino America
Syngenta US
Marrone Bio Innovations