

Arthropod pest management on organic strawberries in Florida

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Strawberries in Florida

- Valued at ~2.3 million USD in 2013
- 2nd largest producer in the U.S. and primary producer of winter strawberries
- Grown as an annual crop on raised beds
- Growing market for organic strawberries

Twospotted spider mites (TSM)



- *Tetranychus urticae* Koch
- Life cycle takes ~19 days and females can lay up to 100 eggs
- Greenish-yellow and red forms
- Optimal conditions for development are high temperatures (up to 38°C) and low humidity

TSM Injury



TSM Management

- Miticides
 - Bifenezate (Acramite®)
 - Abamectin (Agri-Mek®)
 - Hexythiazox (Savey®)
- *Neoseiulus californicus*
 - Prefers Tetranychid mites
 - Will persist on pollen and other small insects and mites
- Predator in first technique



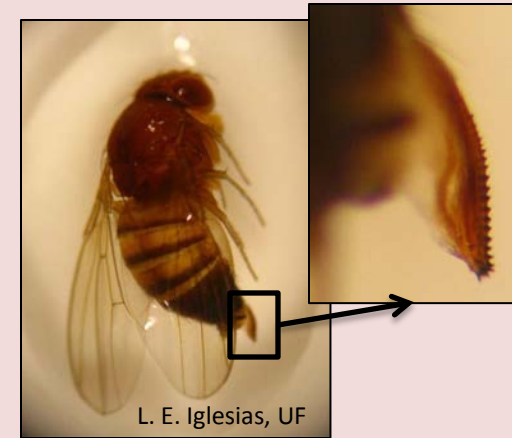
Spotted wing drosophila

- *Drosophila suzukii*
- Lay eggs in ripening and ripe fruit

Male



Female



- The presence of one larvae can cause an entire shipment of fruit to be rejected

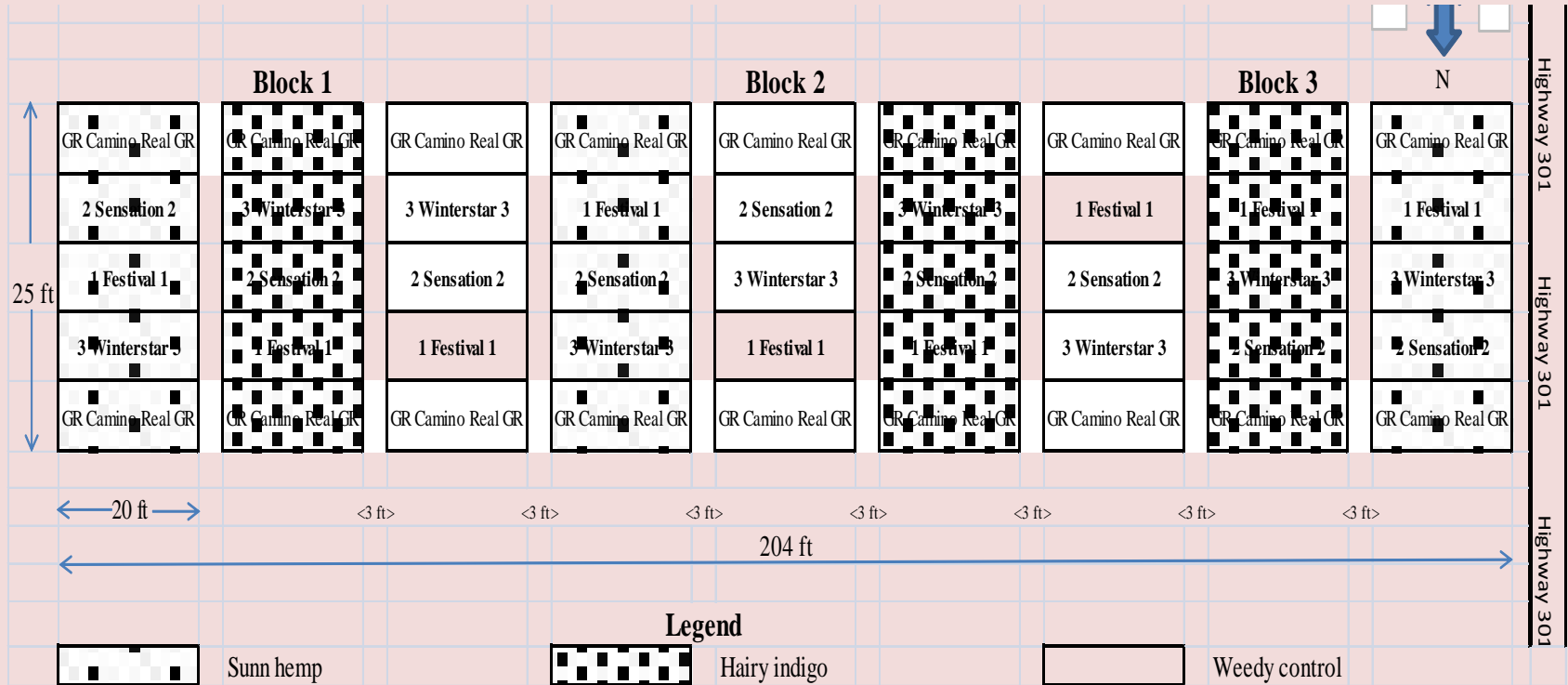
Objectives

- Assess the susceptibility of three strawberry cultivars under organic production to TSM infestation
- Assess the efficacy of the predatory mite *Neoseiulus californicus* for managing TSM on strawberries under organic production
- Monitor the population of SWD on strawberries under organic production

Methods: TSM

- Two organic farms in north-central Florida
- A factorial design with 3 replicates and 2 factors
 - 3 cover crops: hairy indigo, sun hemp, weedy control
 - 3 varieties: Festival, Sensation, Winterstar
- 4 trifoliolate leaves were collected from each plot every other week at farm 1 and weekly at farm 2

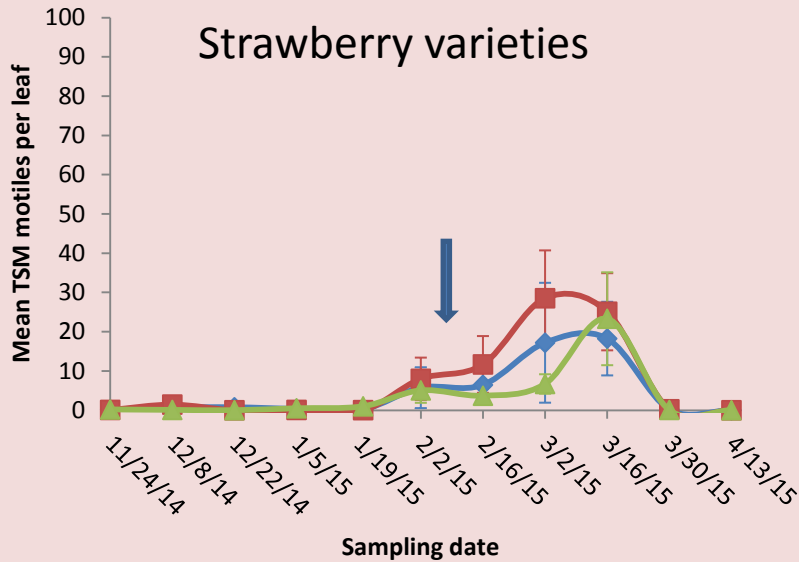
Farm 2 plot map



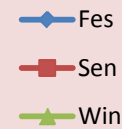
Methods: predatory mite releases

- *N. californicus* mites were released at the preventative rate (25 per m²) on 11/12 and 11/13/15 on farms 1 and 2 respectively
- A second release at the rate of 1 per 10 TSM occurred on 2/11/15 at farm 1 and 1/16/2015 at farm 2

Results: farm 1 TSM motiles



Interaction terms all $P \geq 0.24$



Fes = Festival

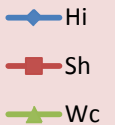
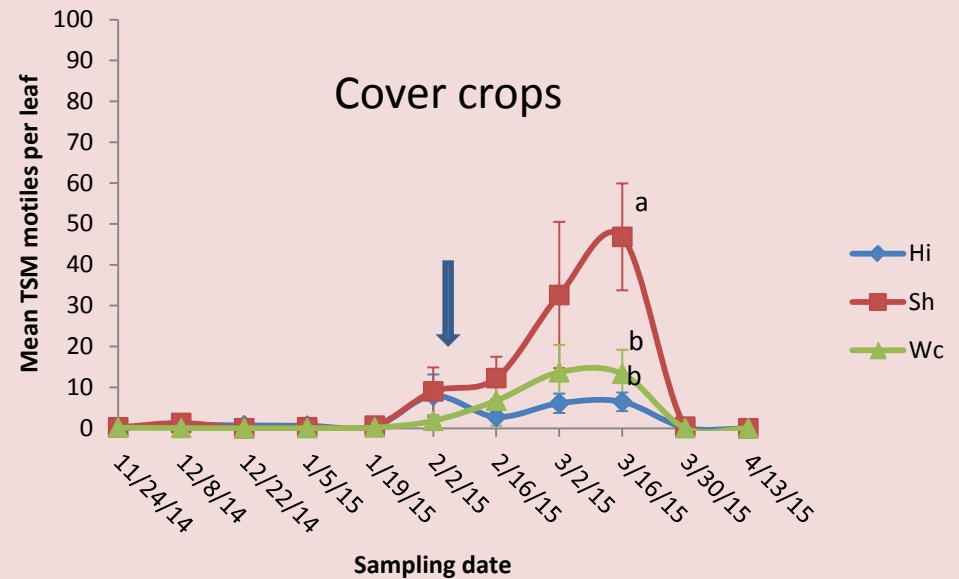
Sen = Sensation

Win = Winterstar

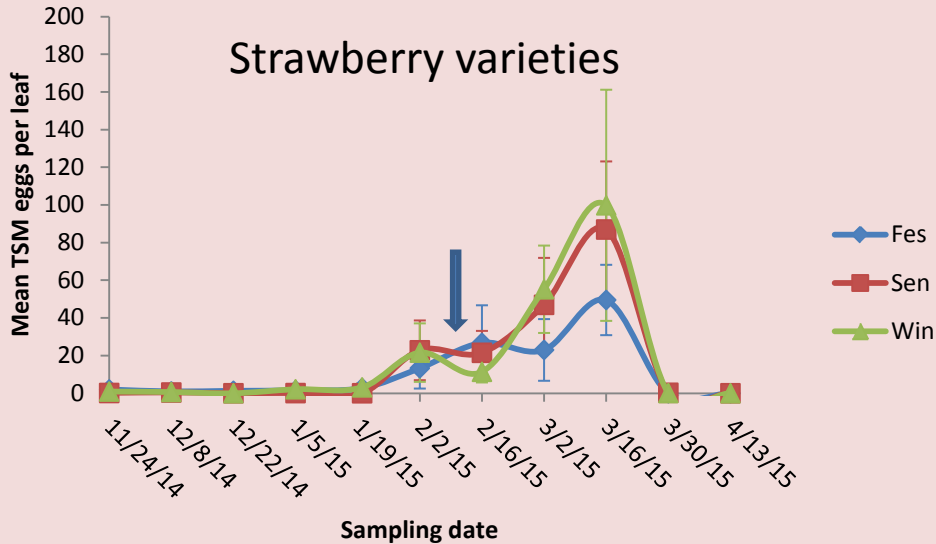
Hi = Hairy indigo

Sh = Sun hemp

Wc = Weedy control



Results: farm 1 TSM eggs



Interaction terms all $P \geq 0.72$

Fes = Festival

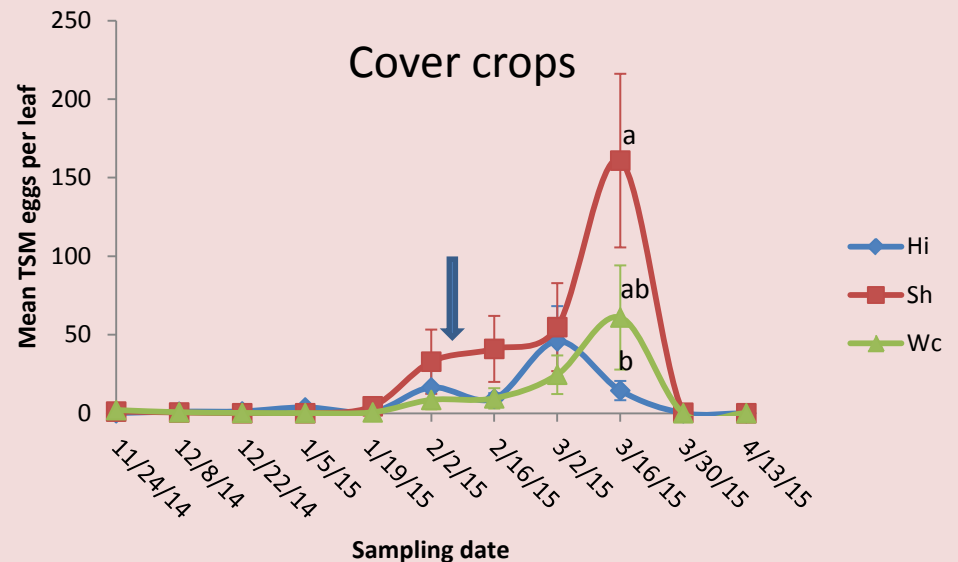
Sen = Sensation

Win = Winterstar

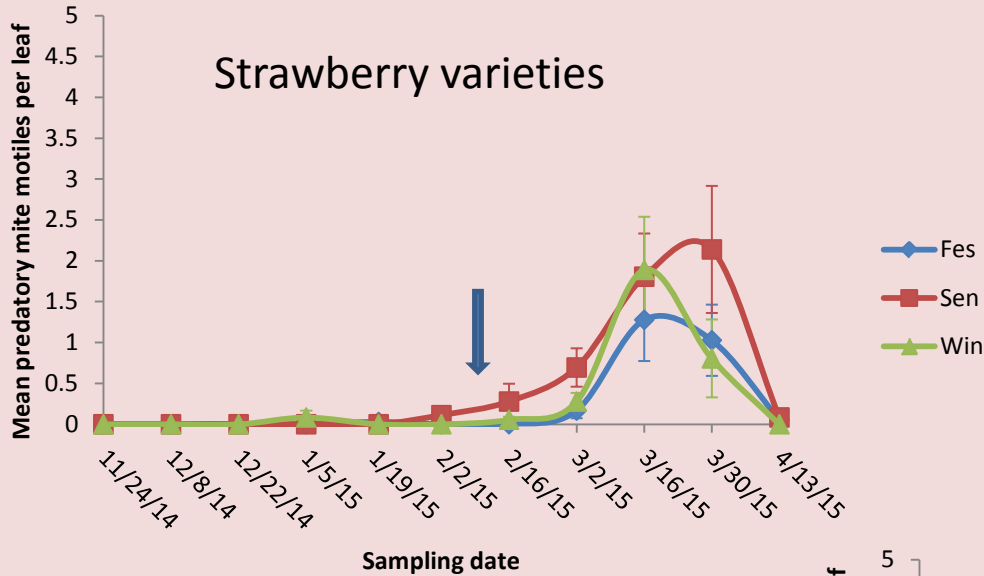
Hi = Hairy indigo

Sh = Sun hemp

Wc = Weedy control



Results: farm 1 *N. californicus* motiles



Interaction terms all $P \geq 0.63$

Fes = Festival

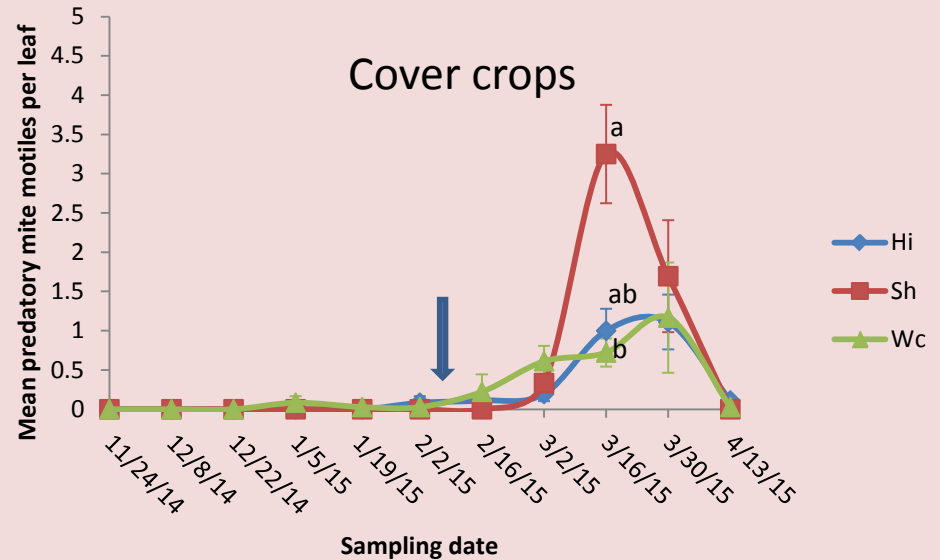
Sen = Sensation

Win = Winterstar

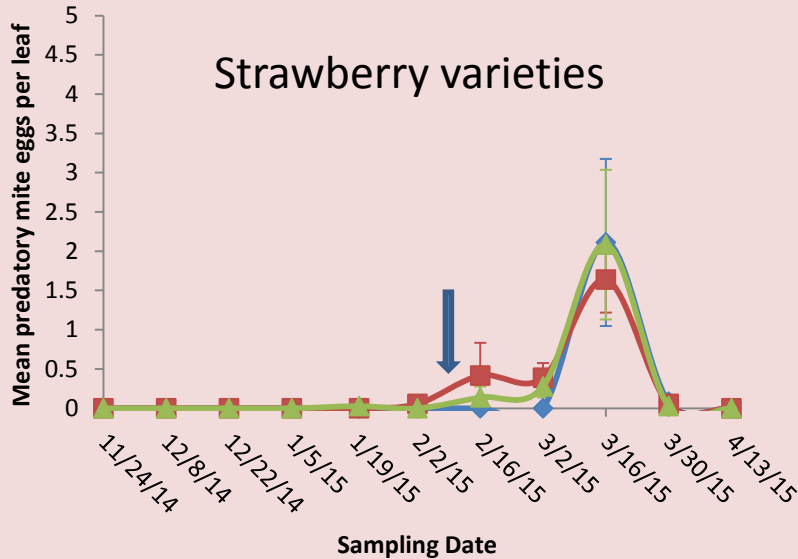
Hi = Hairy indigo

Sh = Sun hemp

Wc = Weedy control



Results: farm 1 *N. californicus* eggs



Interaction term $P = 0.97$

Fes = Festival

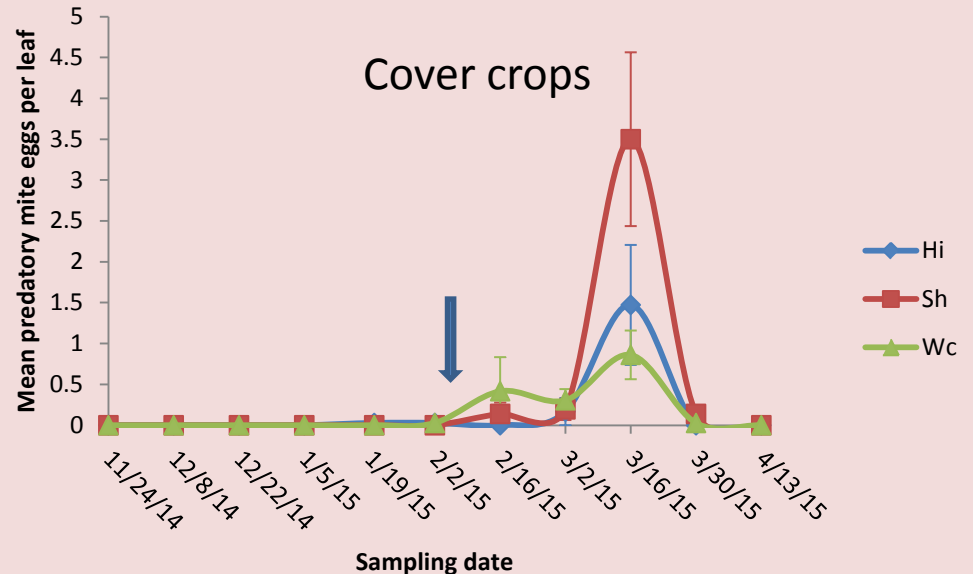
Sen = Sensation

Win = Winterstar

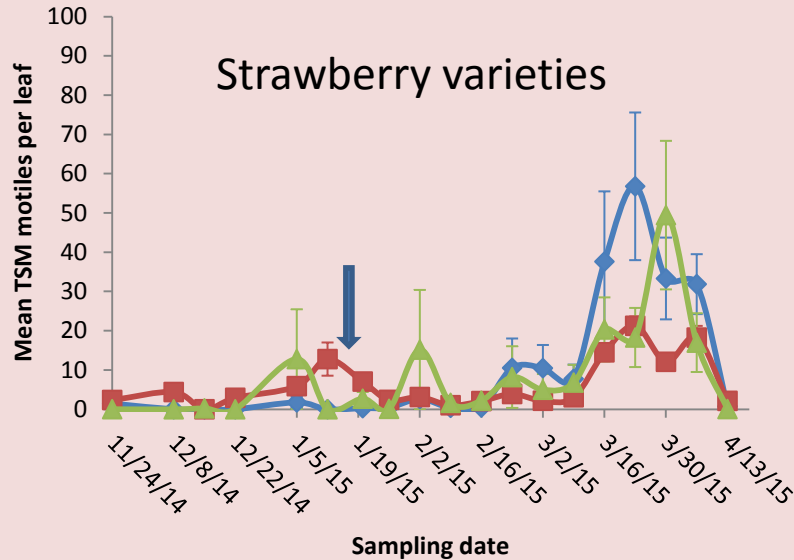
Hi = Hairy indigo

Sh = Sun hemp

Wc = Weedy control



Results: farm 2 TSM motiles



Interaction terms all $P \geq 0.58$

Fes = Festival

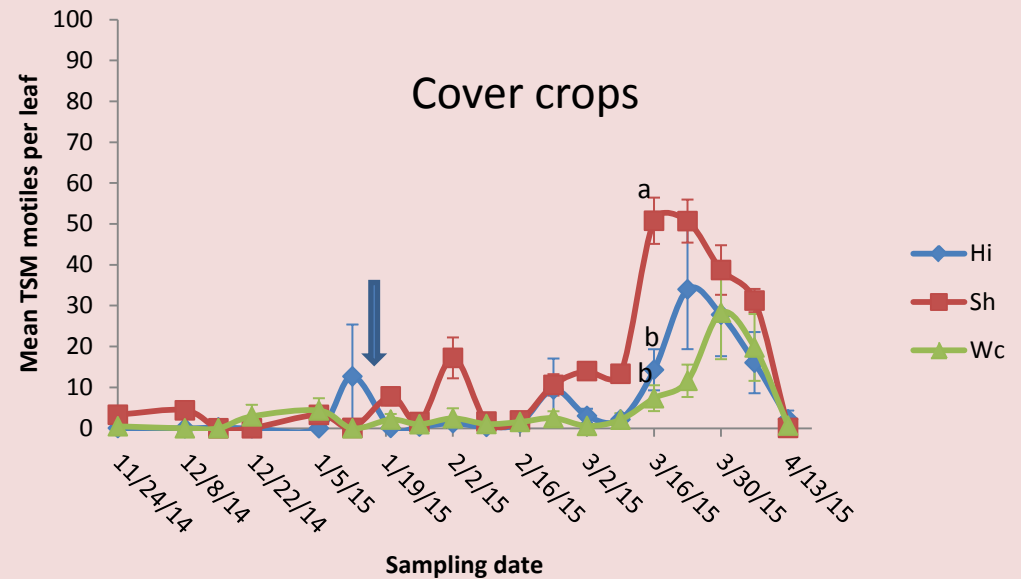
Sen = Sensation

Win = Winterstar

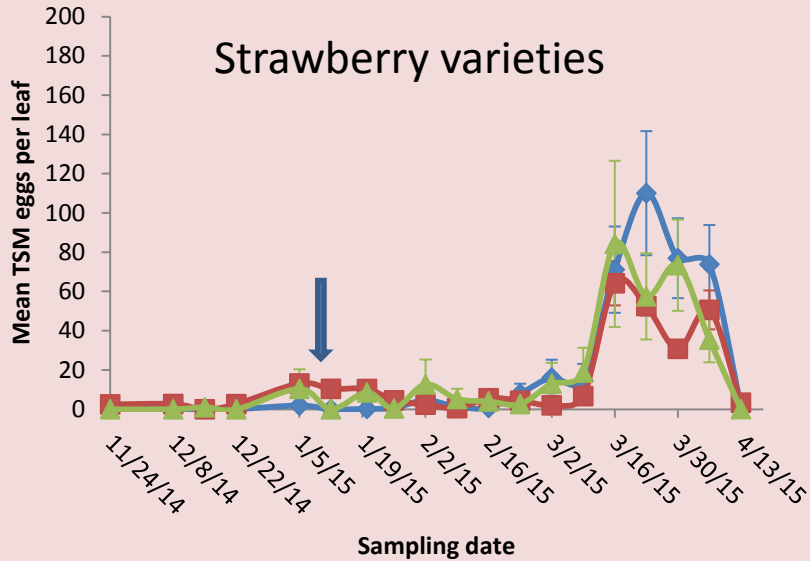
Hi = Hairy indigo

Sh = Sun hemp

Wc = Weedy control



Results: farm 2 TSM eggs



Interaction terms all $P \geq 0.24$

Fes = Festival

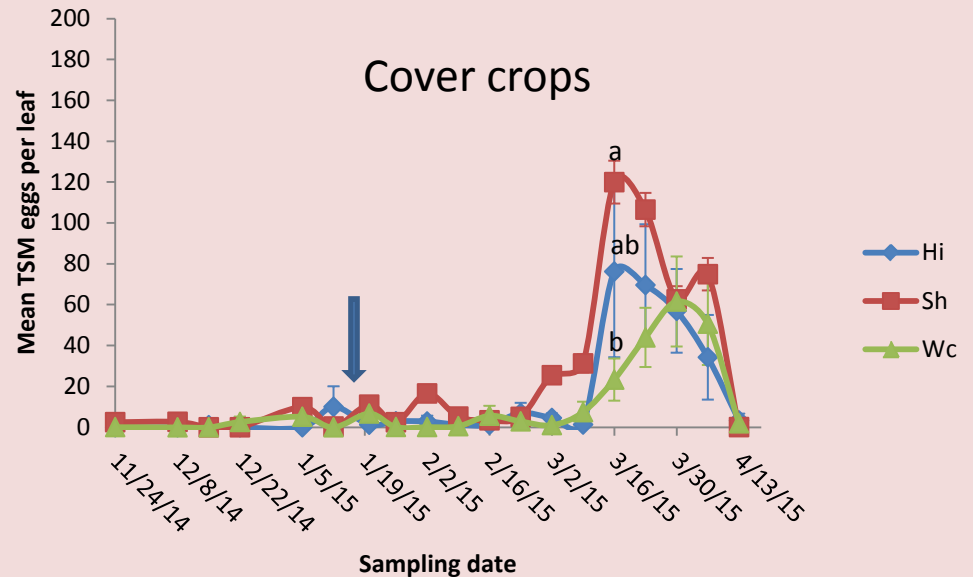
Sen = Sensation

Win = Winterstar

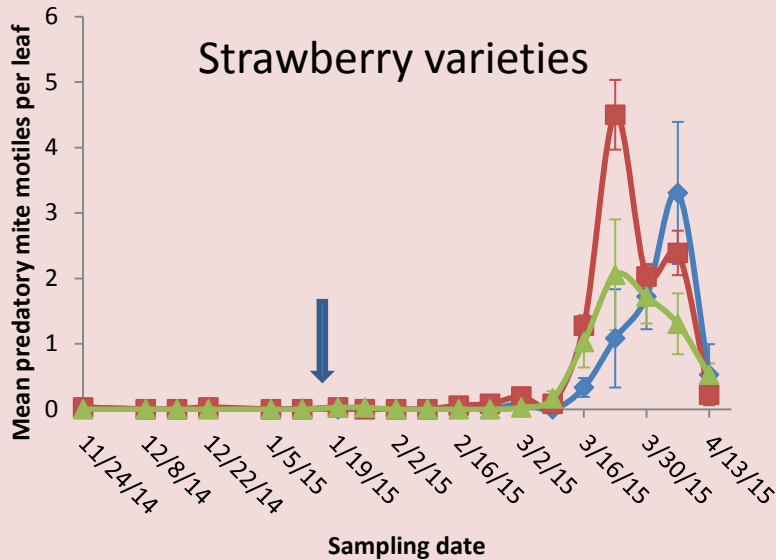
Hi = Hairy indigo

Sh = Sun hemp

Wc = Weedy control



Results: farm 2 *N. californicus* motiles



Interaction terms all $P \geq 0.08$

Fes = Festival

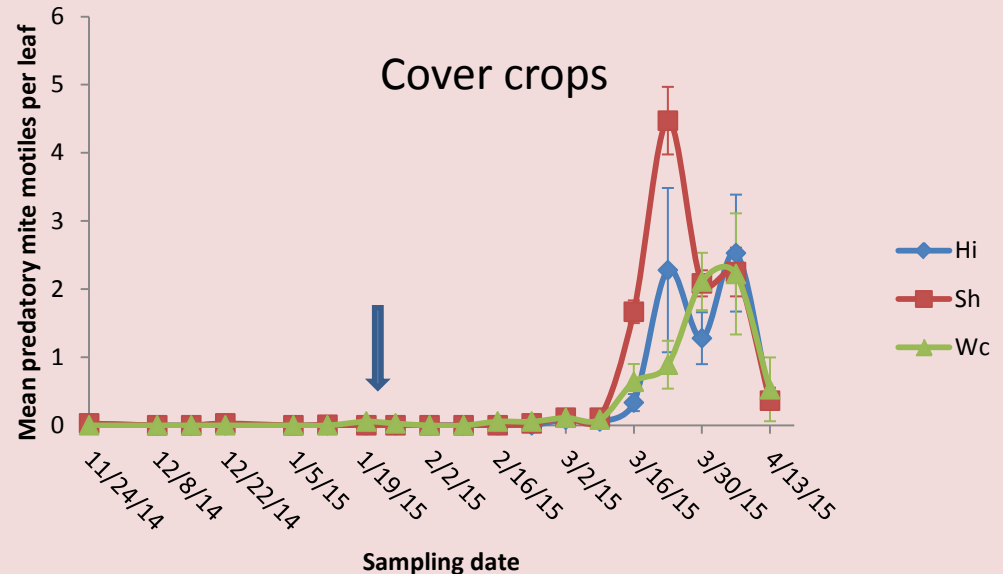
Sen = Sensation

Win = Winterstar

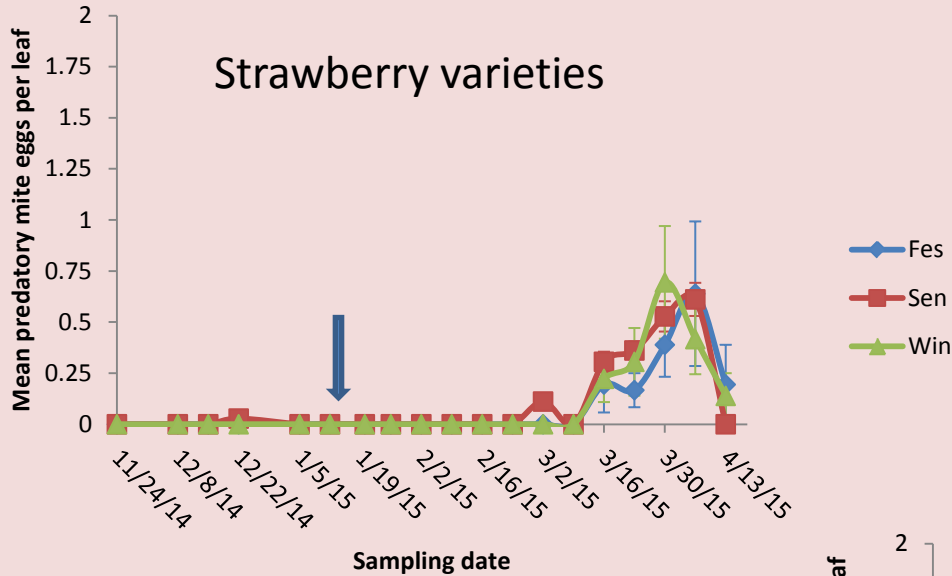
Hi = Hairy indigo

Sh = Sun hemp

Wc = Weedy control



Results: farm 2 *N. californicus* eggs



Fes = Festival

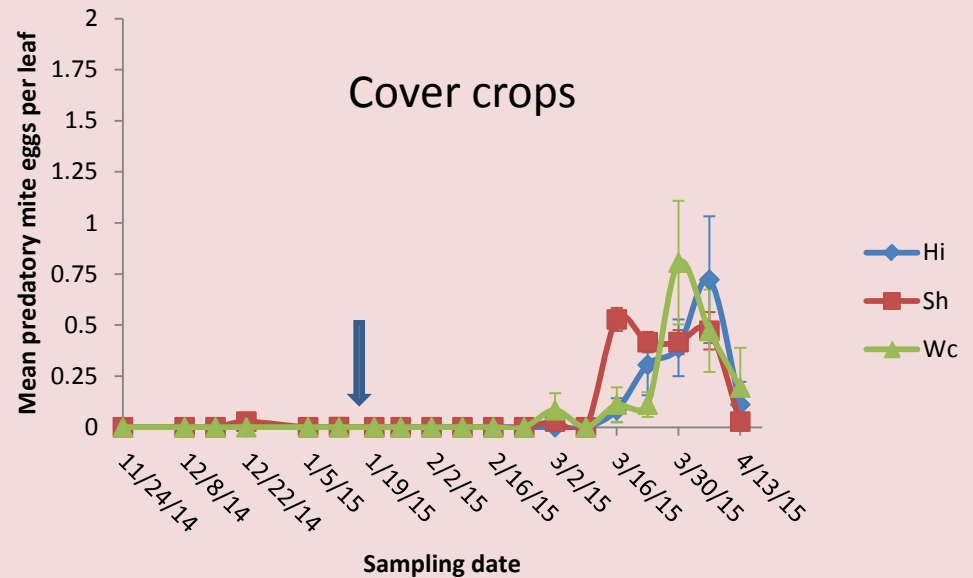
Sen = Sensation

Win = Winterstar

Hi = Hairy indigo

Sh = Sun hemp

Wc = Weedy control



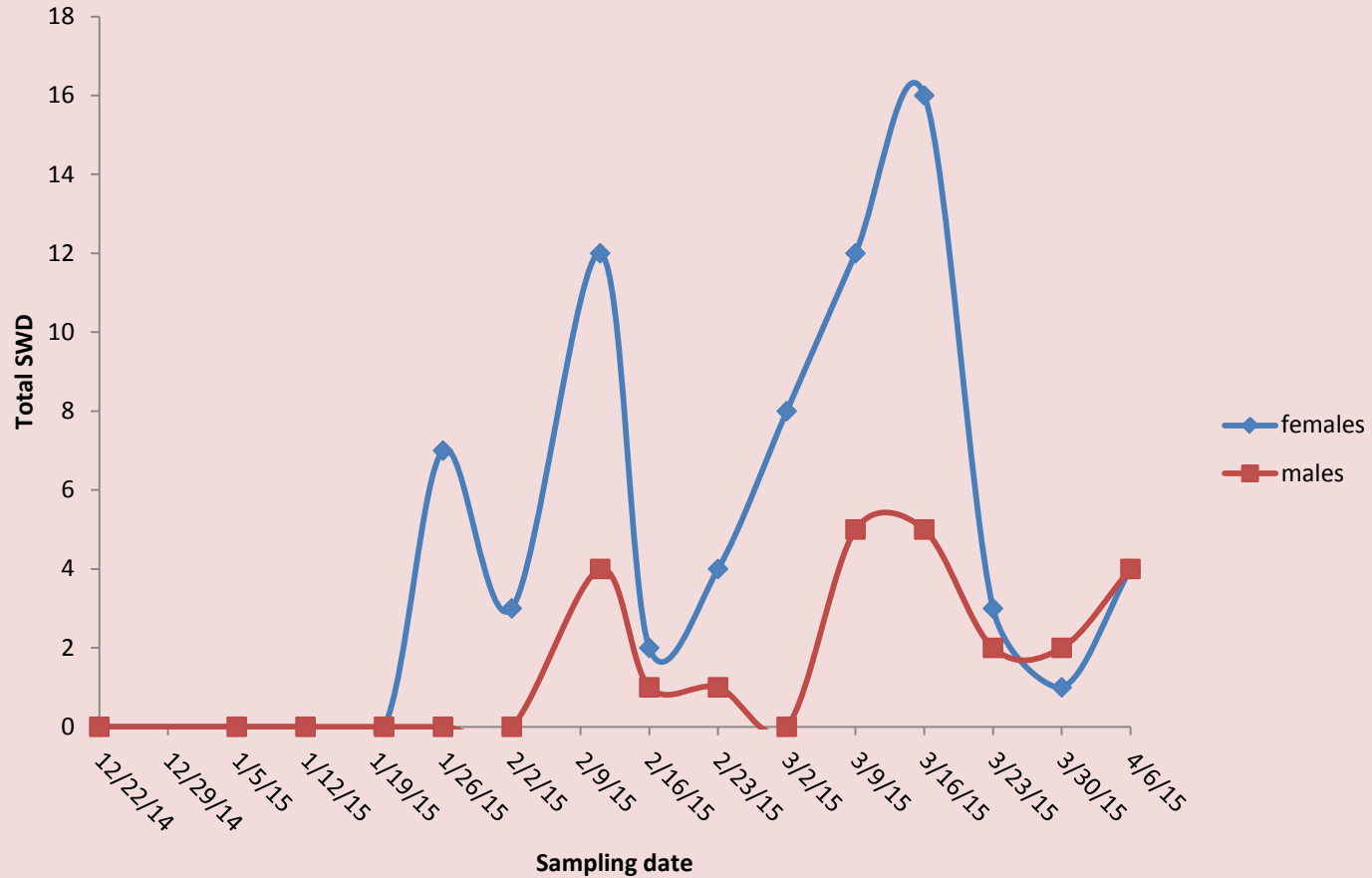
Conclusions

- No differences in TSM or *N. californicus* motiles and eggs among the 3 varieties
- Populations of TSM motiles and eggs and *N. californicus* motiles peaked at higher numbers in the sun hemp cover crop treatment
- *N. californicus* releases effectively managed TSM populations

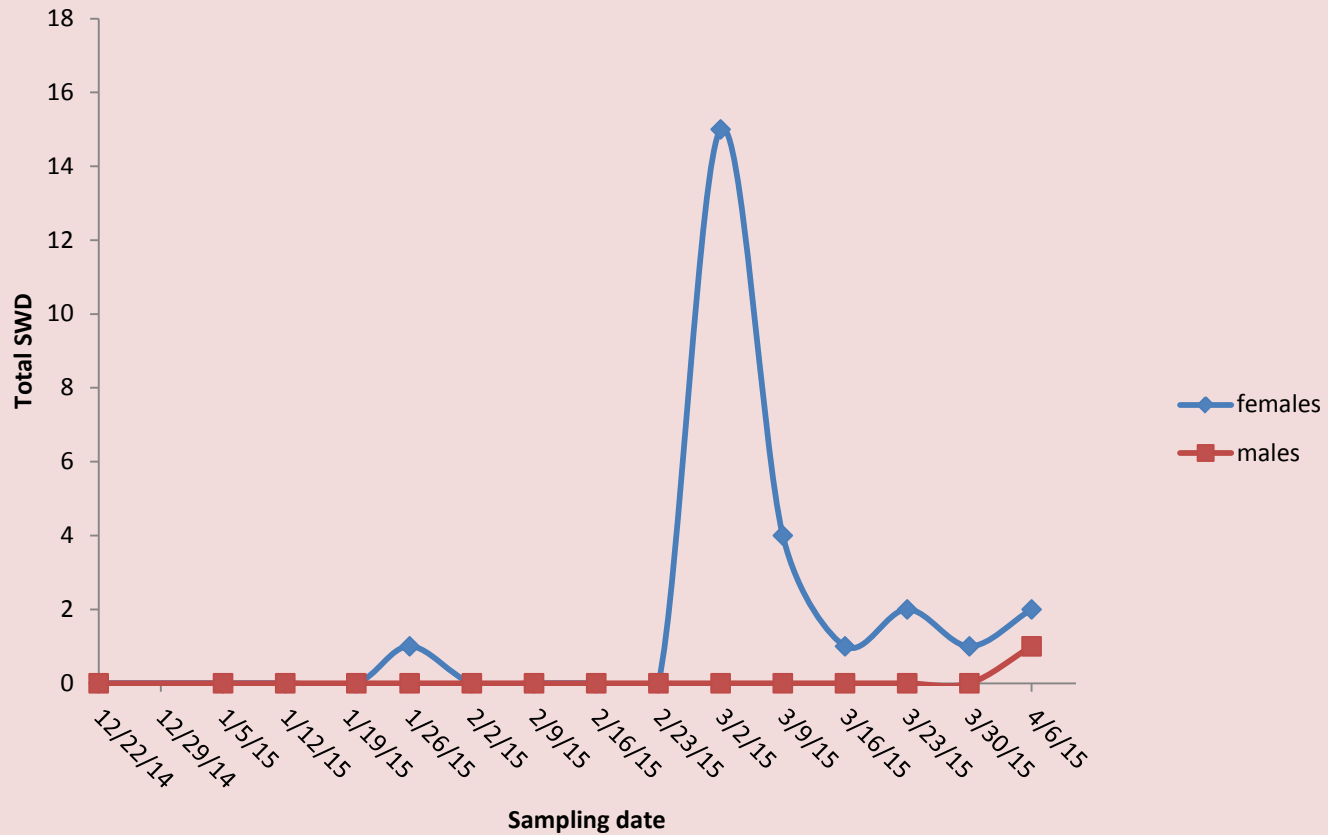
SWD methods

- Three traps per farm checked weekly
 - Yeast + sugar + water bait with dish soap
- Traps were placed in a diagonal line with 1 trap in the center of the plot and the other two near opposite corners of the plot
- Numbers of SWD males and females were counted and recorded

Results: farm 1 SWD



Results: farm 2 SWD



Conclusions

- There is an established SWD population on farm 1
- The SWD population on farm 2 appears to be more transitory

Summary

- There were no differences in TSM or *N. californicus* numbers among the varieties Festival, Sensation, and Winterstar
- Populations of TSM and *N. californicus* peaked at higher numbers when sun hemp was used as a cover crop
- A predator-in-first release followed by a release when TSM numbers began to increase successfully managed TSM populations on both farms
- SWD is present on both farms with an established population on farm 1

Acknowledgements

- Small Fruit and Vegetable IPM lab staff and students
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