Ecology and management of the twospotted spider mite, *Tetranychus urticae*, in organic strawberries in Florida

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Strawberries in Florida

- 2nd largest producer in the U.S.
  - 10,800 acres in 2017
- Primary producer of winter strawberries
- Valued at ~337 million USD in 2017
- Growing market for organic strawberries

Strawberry pests

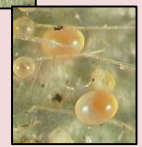
- Spotted wing drosophila, *Drosophila suzukii*
- Thrips: *Frankliniella occidentalis*, *Scirtothrips dorsalis*
- Pamera seed bug, *Neopamera bilobata*
- Sap beetles (Nitidulidae)
- Aphids, armyworms, etc.

Twospotted spider mites (TSM)

- *Tetranychus urticae*

Spider mite predators

- Predatory mites
  - *Neoseiulus californicus*
  - *Phytoseiulus persimilis*



- Six-spotted thrips, *Scolothrips sexmaculatus*

Objectives

- Assess the effect of strawberry variety and cover crop on TSM and its predators

- Compare preliminary, whole plot, and spot treatment applications of *N. californicus* for control of TSM

Variety and cover crop effects

OBJECTIVE 1

Methods: sampling

- Citra PSREU
- Split plot: main plots = cover crops, subplots = varieties
- Weekly leaf samples: 3 per subplot
  14 Nov 2017 – 26 Mar 2018
- TSM motiles and eggs, predatory mite motiles and eggs, and Six-spotted thrips per leaf counted and recorded
- Bi weekly yield data 29 Nov 2017 – 29 Mar 2018

Legend (main plots)
HI = Hairy Indigo
M = Mix (sun hemp, hairy indigo, American jointvetch, and slenderleaf rattlebox)
SH = Sun Hemp
WC = Weedy Control

Legend (subplots)

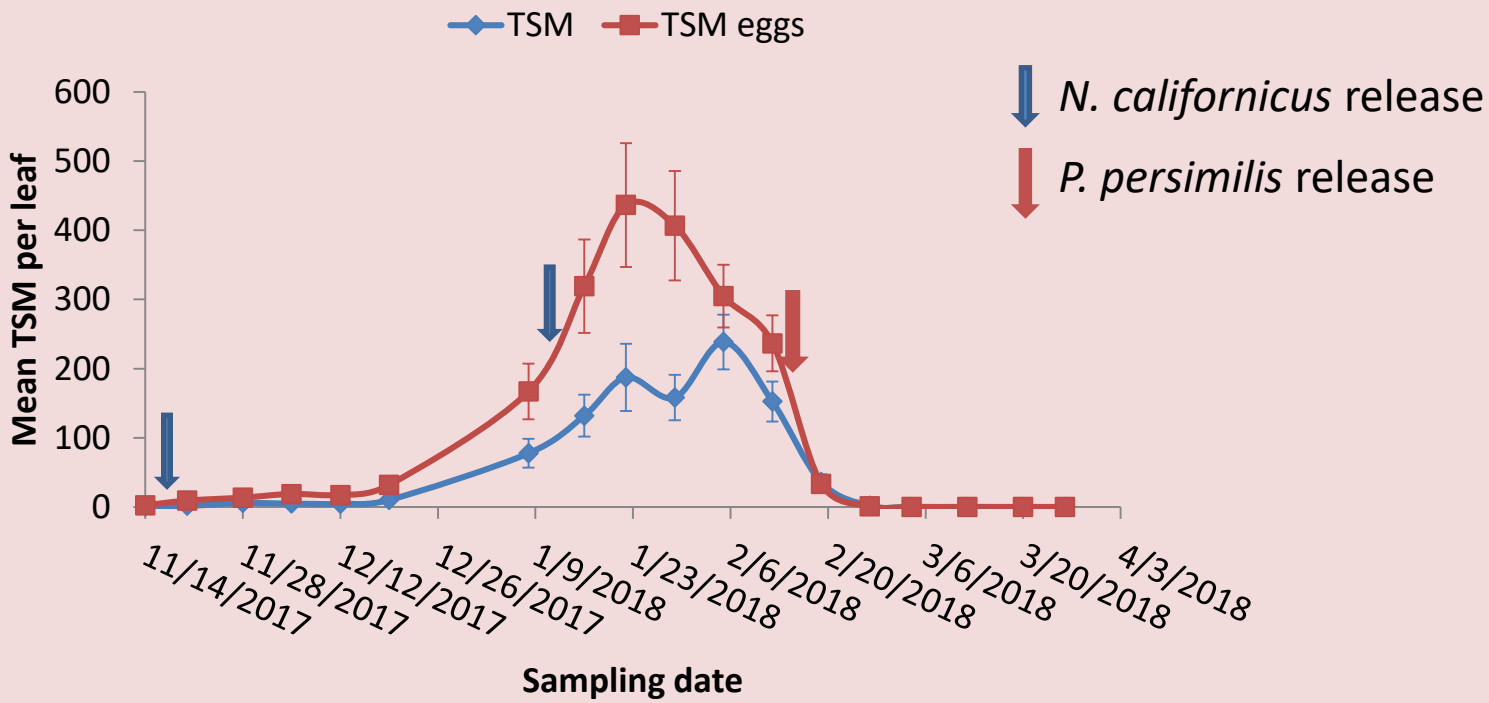
Beauty

Radiance

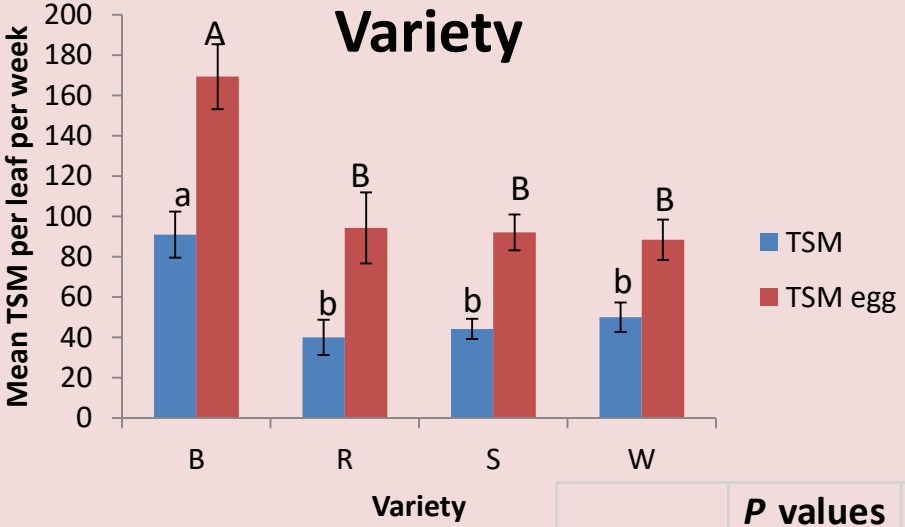
Sensation

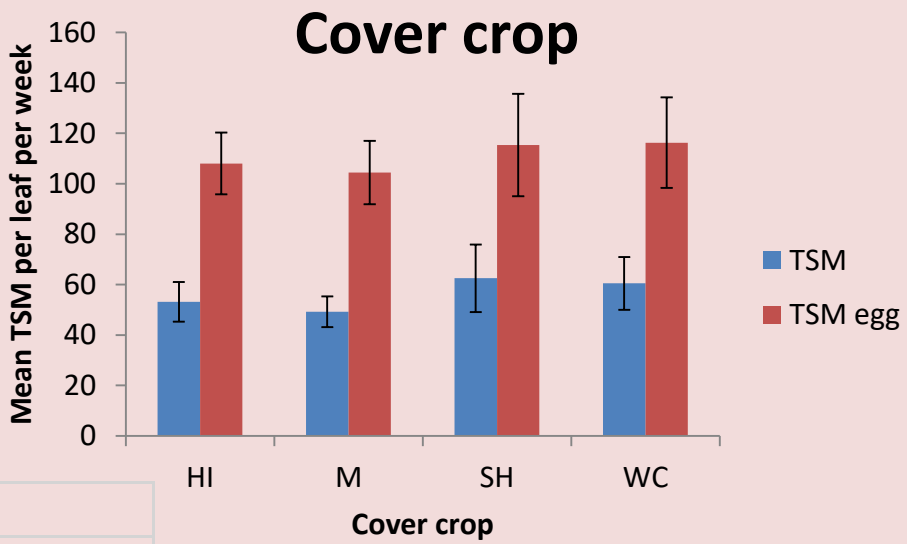
Winterstar

Results: TSM


TSM
TSM eggs
N. californicus release
P. persimilis release
Mean TSM per leaf
600
500
400
300
200
100
0
11/14/2017
11/28/2017
12/12/2017
12/26/2017
1/9/2018
1/23/2018
2/6/2018
2/20/2018
3/6/2018
3/20/2018
4/3/2018
Sampling date

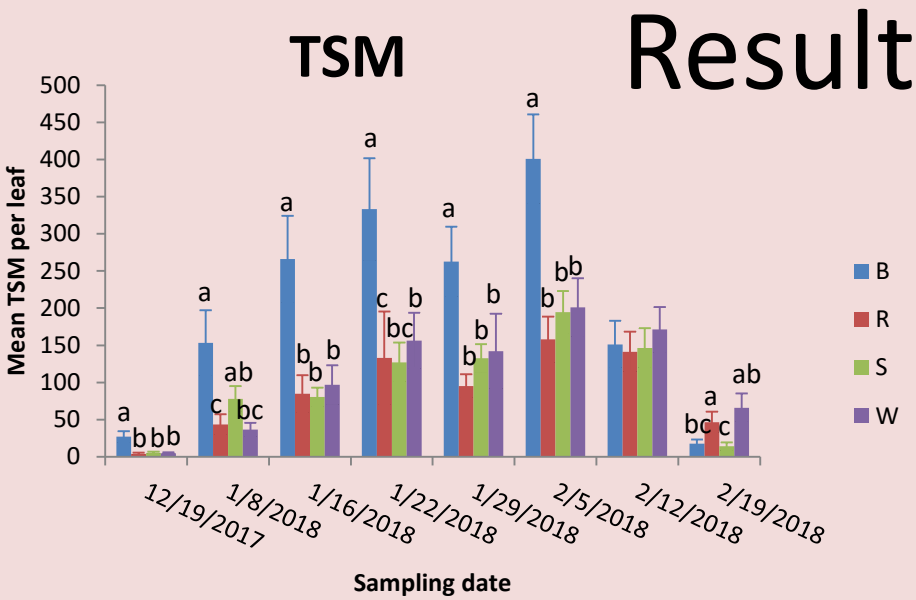
Results: TSM

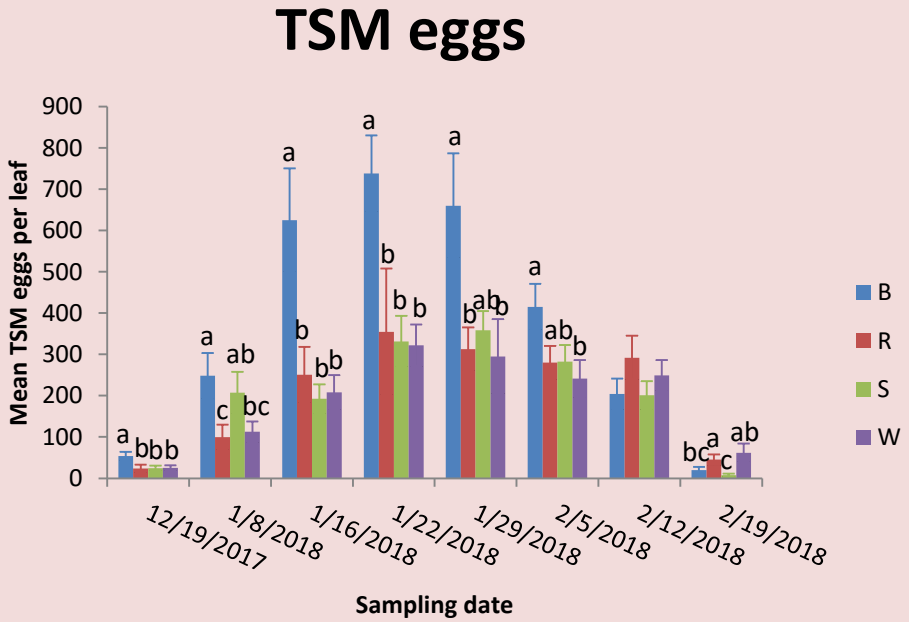




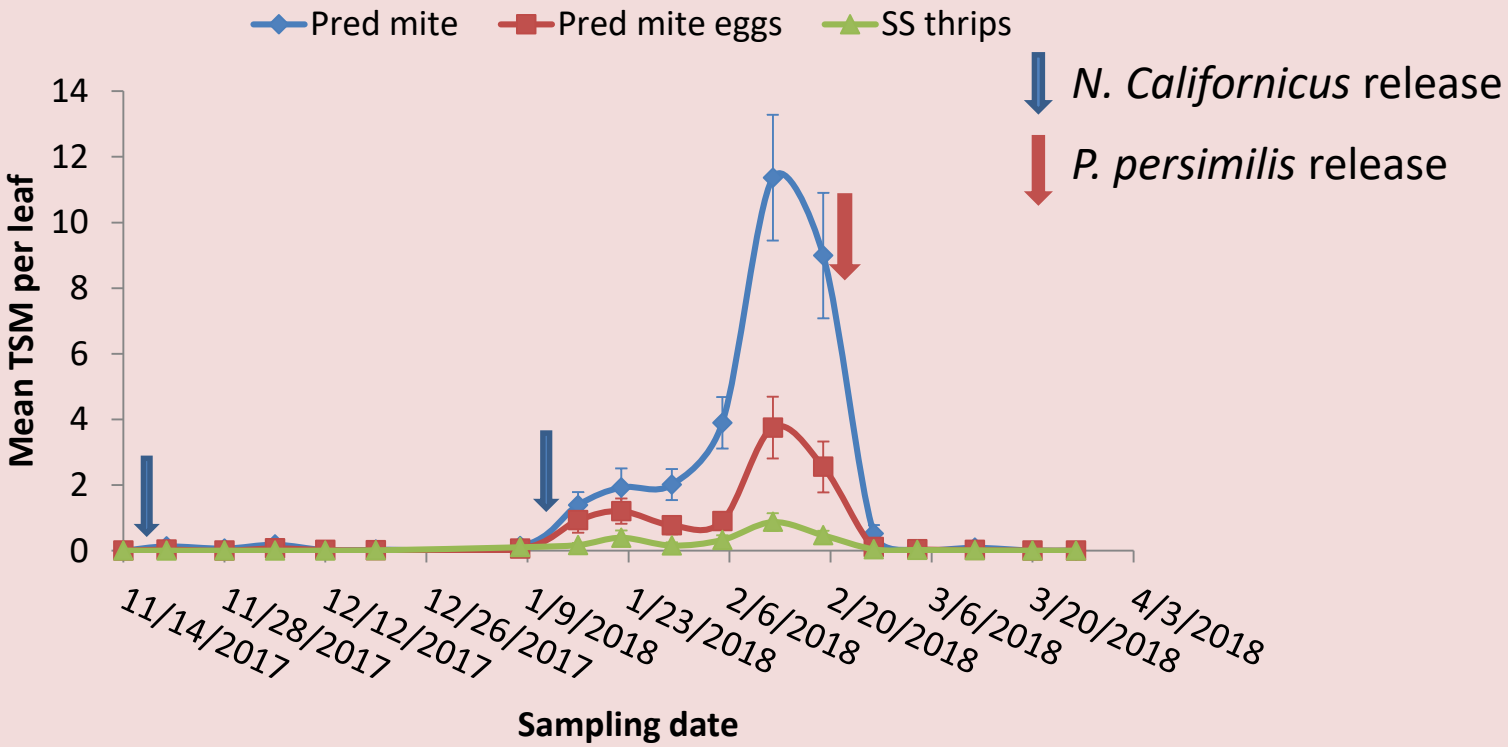
	P values	
	TSM	TSM egg
CC	0.81	0.9991
var	< 0.0001	0.0053
CC*var	0.12	0.46
time*CC	0.47	0.71
time*var	< 0.0001	< 0.0001

Results: TSM

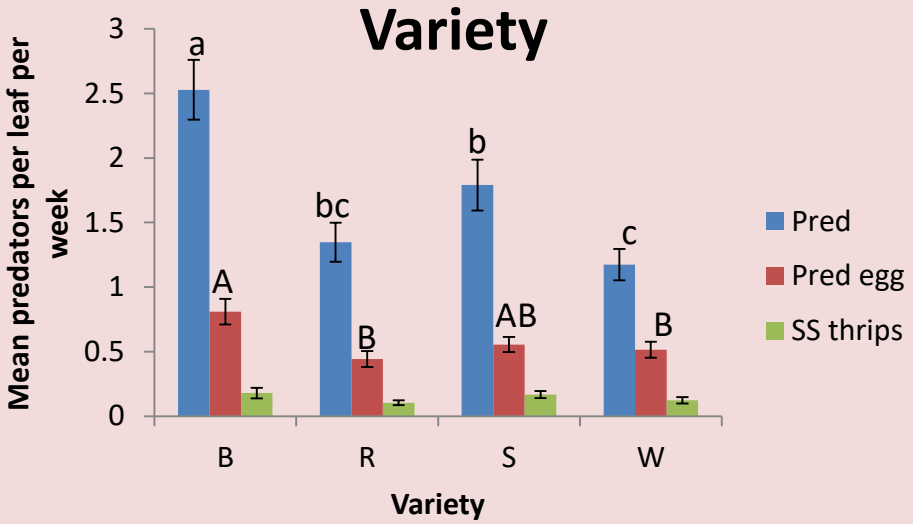

TSM
Mean TSM per leaf
500
450
400
350
300
250
200
150
100
50
0
12/19/2017
1/8/2018
1/16/2018
1/22/2018
1/29/2018
2/5/2018
2/12/2018
2/19/2018
Sampling date
B
R
S
W

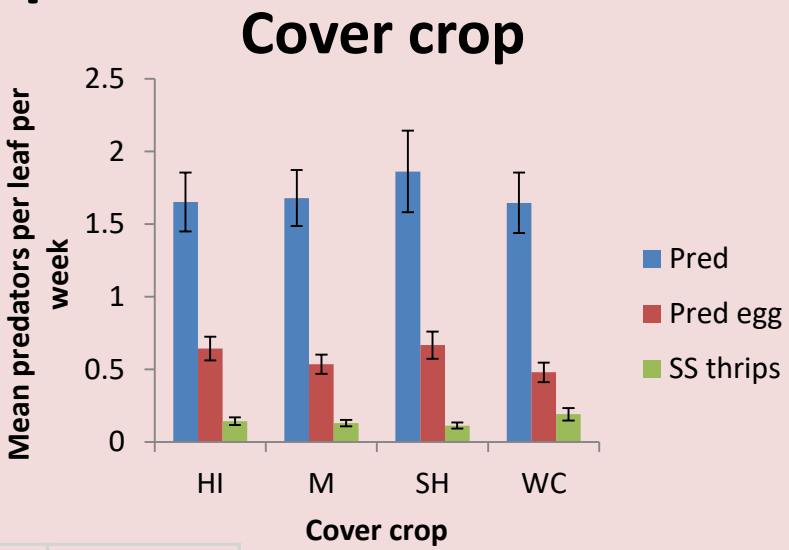

TSM eggs
Mean TSM eggs per leaf
900
800
700
600
500
400
300
200
100
0
12/19/2017
1/8/2018
1/16/2018
1/22/2018
1/29/2018
2/5/2018
2/12/2018
2/19/2018
Sampling date
B
R
S
W

Results: TSM predators



Results: TSM predators

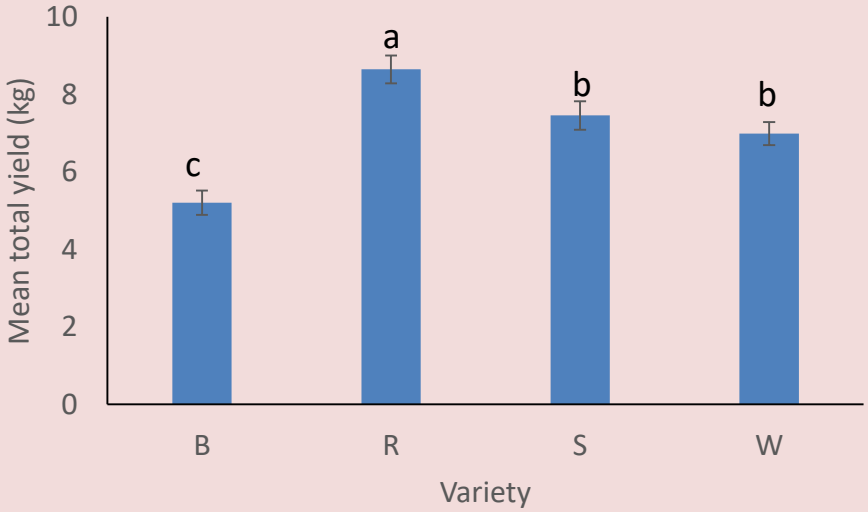




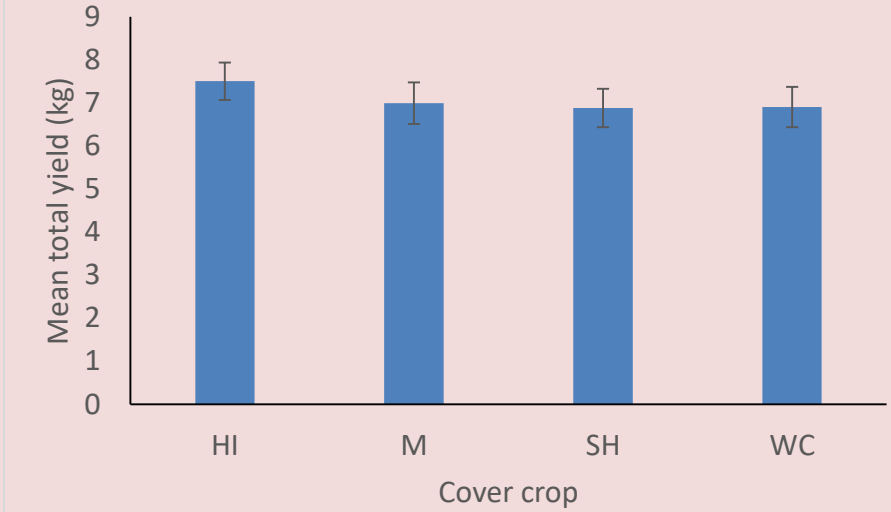
	***P* values**		
	pred	pred egg	SS thrips
CC	0.99	0.44	0.4
var	0.0002	0.039	0.21
CC*var	0.51	0.82	0.41

Results: Yield

Variety



Cover crop



	***P* values**
CC	0.62
var	< 0.0001
CC*var	0.81

Summary

- Higher TSM in ‘Beauty’
- Higher predatory mites in ‘Beauty’
- Highest yield in ‘Radiance’, lowest in ‘Beauty’
- No effect of cover crop on TSM, Predatory mites, or yield

N. Californicus releases

OBJECTIVE 2

Methods

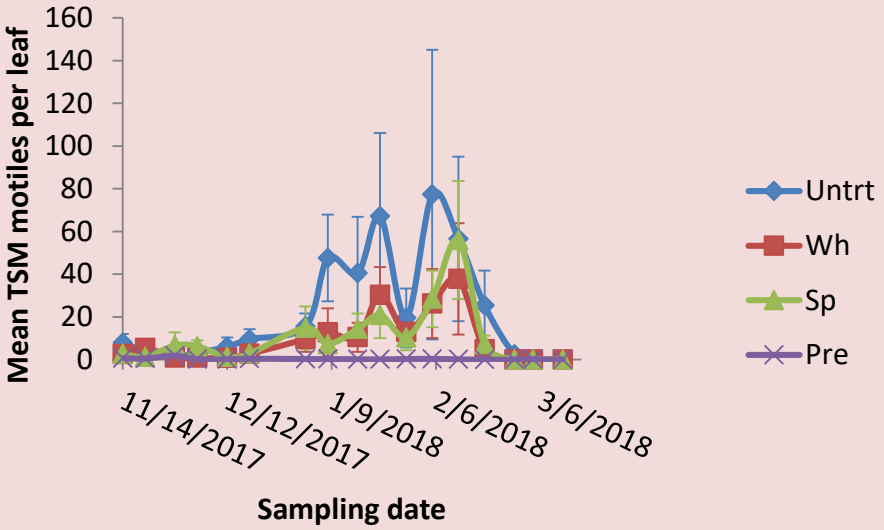
- Citra PSREU
- RCBD with 5 reps of 4 trts
- Weekly leaf samples: 5 per plot 14 Nov 2017 – 12 Mar 2018
- TSM motiles and eggs, predatory mite motiles and eggs, and Six-spotted thrips per leaf counted and recorded
- Bi weekly yield data 29 Nov 2017 – 29 Mar 2018

Releases

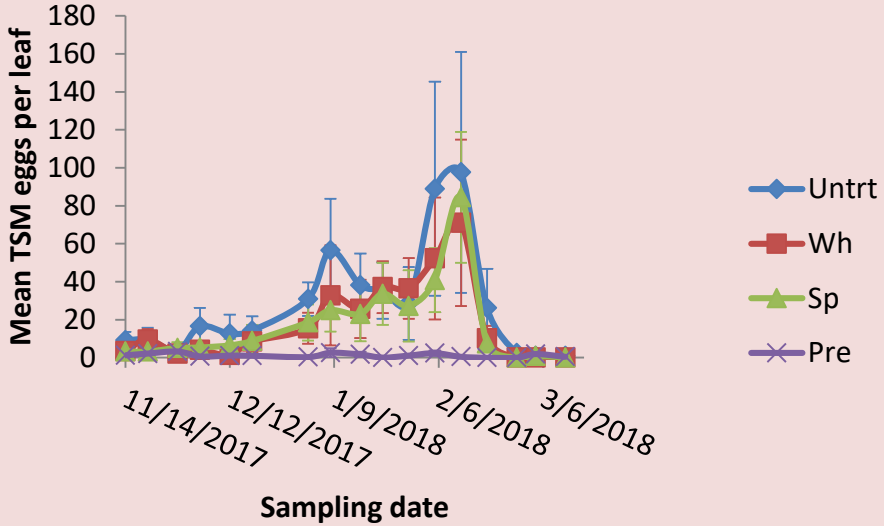
- Preventative: 11/16/2017 at 25 per m^2
- Whole and split plot trts: 1/11/2018 at 1 per 10 TSM

Results

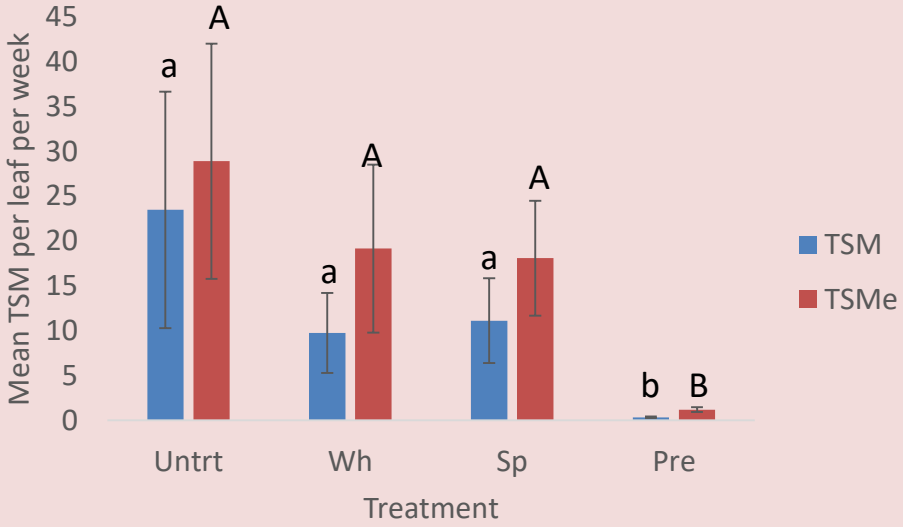
TSM



TSM eggs



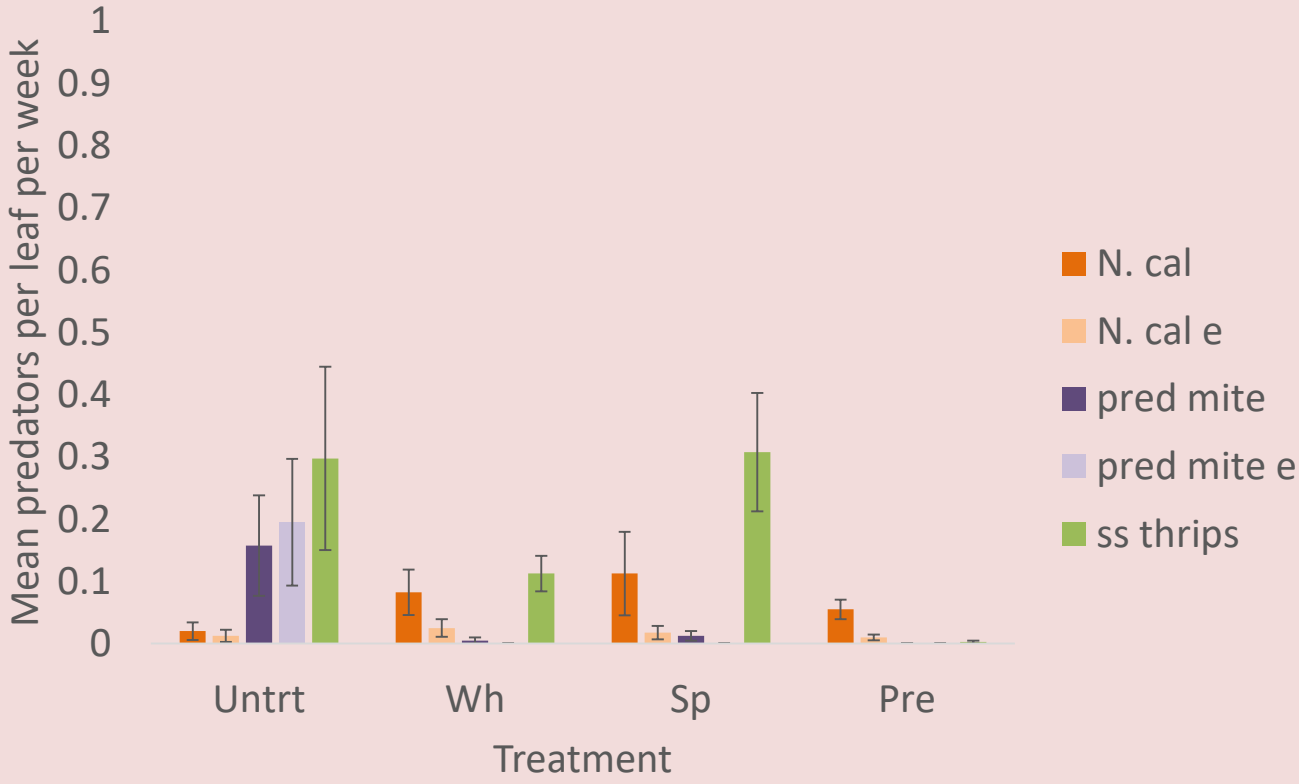
Results



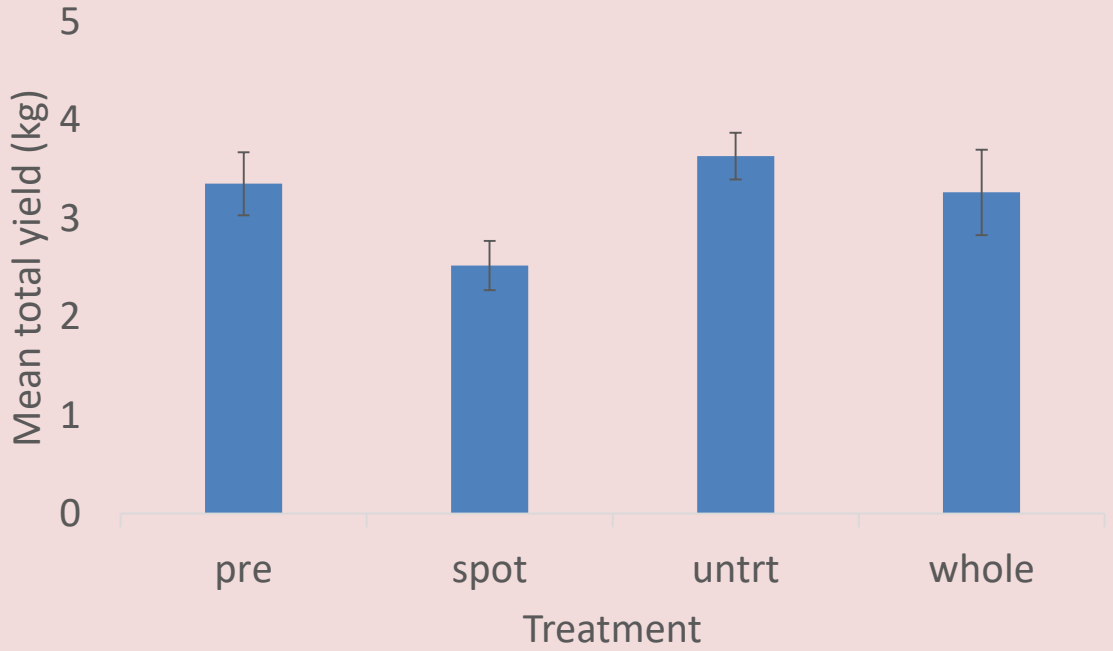
TSM $P < 0.0001$

TSM eggs $P = 0.0007$

Results


Mean predators per leaf per week
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Untrt
Wh
Sp
Pre
Treatment
N. cal
N. cal e
pred mite
pred mite e
ss thrips

Results: yield



$P = 0.19$

Summary

- Significantly fewer TSM in preventative release treatment
- No differences in yield

Overall summary

- Higher TSM and lowest yield in ‘Beauty’
- No effect of cover crop on TSM, TSM predators, or yield
- The preventative release of *N. californicus* kept TSM numbers low throughout the season

Acknowledgements

- Small Fruit and Vegetable IPM lab staff and students
- Chase lab staff and students
- Citra PSREU staff
- USDA NIFA for funding