



Control of Twospotted Spider Mites on Strawberry in North Florida with Predatory Mites and Acramite®

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Strawberry Production in Florida



- ◆ Ranks 2nd behind CA
- ◆ Produces 100% of the domestically grown winter strawberries
- ◆ 7,000 acres
- ◆ \$190 million value
- ◆ Twospotted spider mite is the major arthropod pest



Twospotted Spider Mite (TSSM)



◆ *Tetranychus urticae* Koch

◆ Life cycle takes ~19 days and females can lay up to 100 eggs





Cultural Control of TSSM

- ◆ Plant mite-free transplants
- ◆ Sanitation
 - Plant residue can harbor TSSM populations

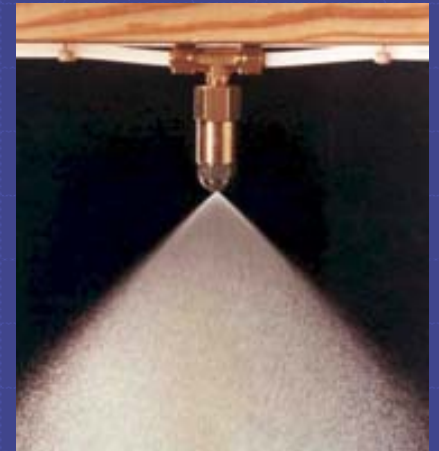


Chemical Control of TSSM



◆ Miticides

- Agri-Mek® (Abamectin)
- Savey® (Hexythiazox)
- **Acramite 50WP® (Bifenazate)**
- Brigade® (Bifenthrin)
- Vendex® (Fenbutatin-oxide)



Biological Control of TSSM



◆ Predatory mites

- *Phytoseiulus persimilis* Athias-Henriot
- *Neoseiulus californicus* McGregor



Previous Research



- ◆ *P. persimilis* is used effectively to control TSSM in 30% - 40% of strawberry fields in South-central Florida. (Decou, 1994 and van de Vrie and Price, 1994)
- ◆ *P. persimilis* does not adequately control TSSM in more northern areas of the state. (White and Liburd, 2003)
- ◆ *N. californicus* is known to effectively control TSSM in strawberry fields in California. (Oatman et al. 1977a; Oatman et al. 1977b; and others)
- ◆ There are many papers on the effectiveness of both species in other parts of the world, mostly studies of *P. persimilis*.

Objectives



- ◆ To conduct controlled laboratory experiments comparing the effectiveness of the predatory mites *P. persimilis* and *N. californicus* for control of TSSM.
- ◆ To determine if *N. californicus* can provide effective control of TSSM in north Florida strawberry fields
- ◆ To compare predatory mites with a reduced-risk miticide (Acramite 50WP®) to determine their efficacy on twospotted spider mite control.

Methods (Laboratory)



◆ Colony

- A TSSM colony reared on strawberries was maintained in the laboratory to ensure that only TSSM predisposed to strawberries were used in the experiments.



Methods (Laboratory)



◆ Experimental Setup

- 10 TSSM were released onto each of 15 plants and allowed to multiply for 2 weeks.
- After these two weeks one leaflet from each plant was sampled.
- Predatory mites were released onto each plant 3 days after the initial sample was taken

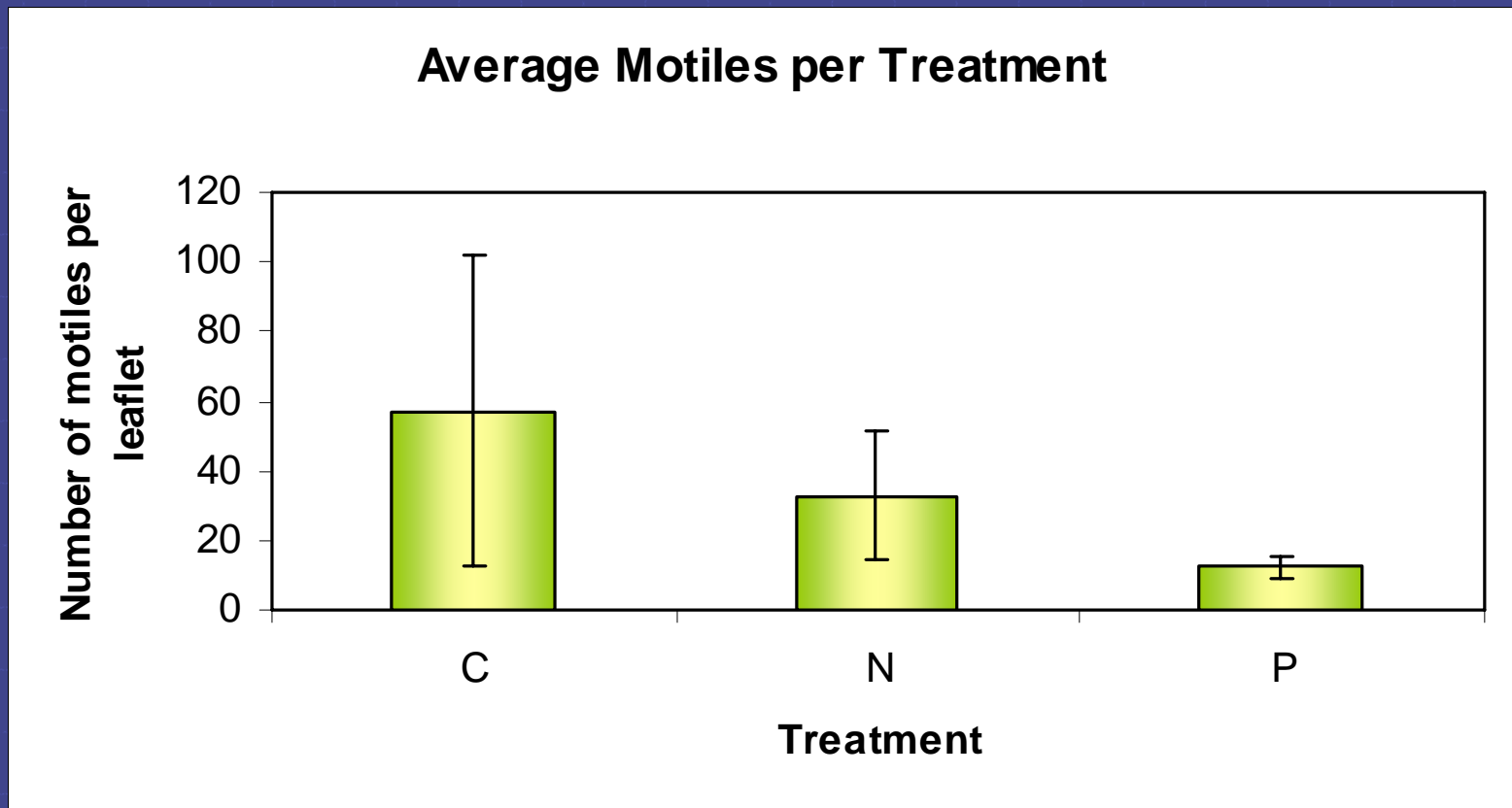


Methods (Laboratory)



- Setup:
 - ◆ Five replicates of three treatments:
 - Untreated (control) plants
 - 10 *P. persimilis* per plant
 - 10 *N. californicus* per plant
- TSSM and predatory mite populations were sampled once a week for 5 weeks.

Laboratory Results (Motiles)

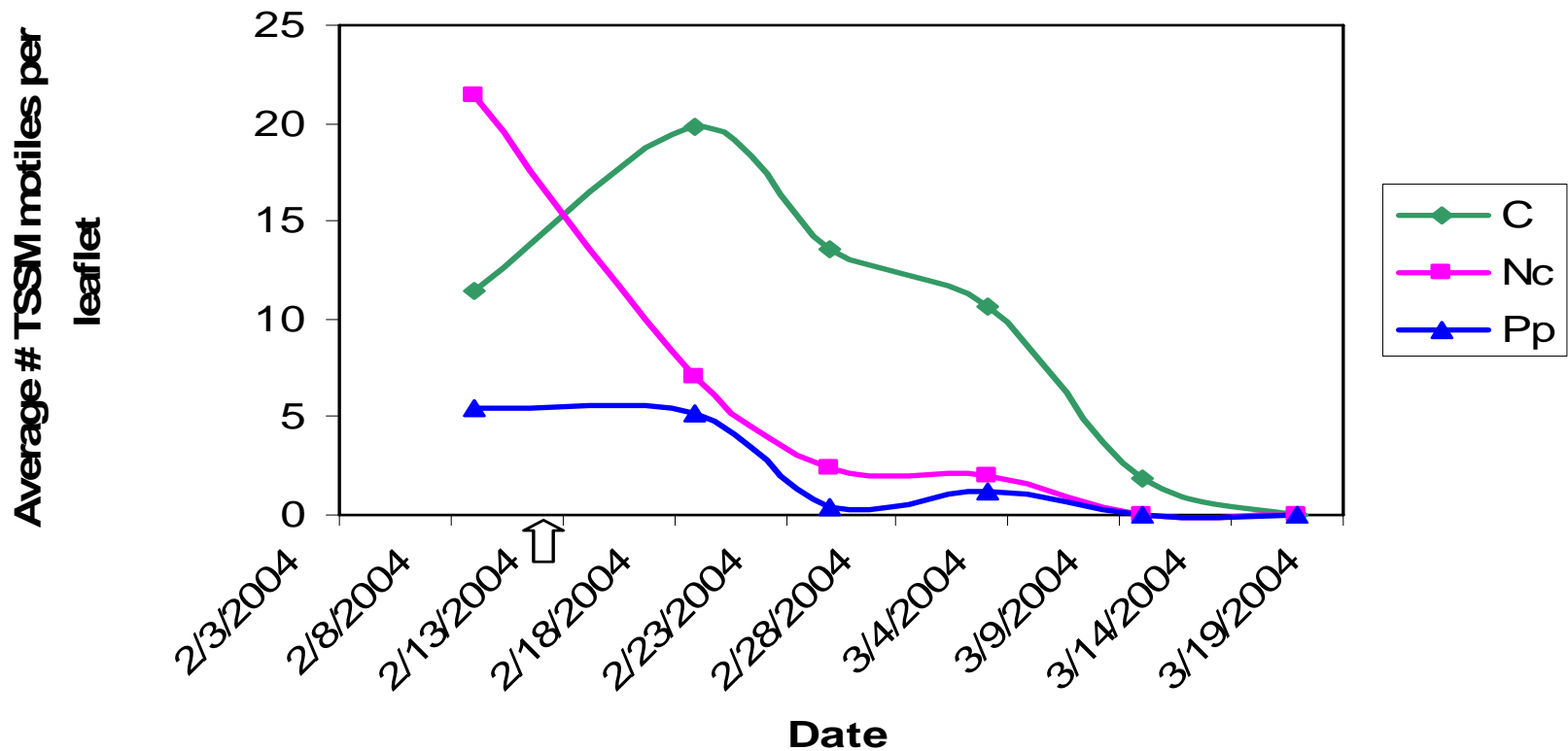


$F = 0.91$ $df = 2,8$ $P = 0.4400$

Laboratory Results (Motiles)

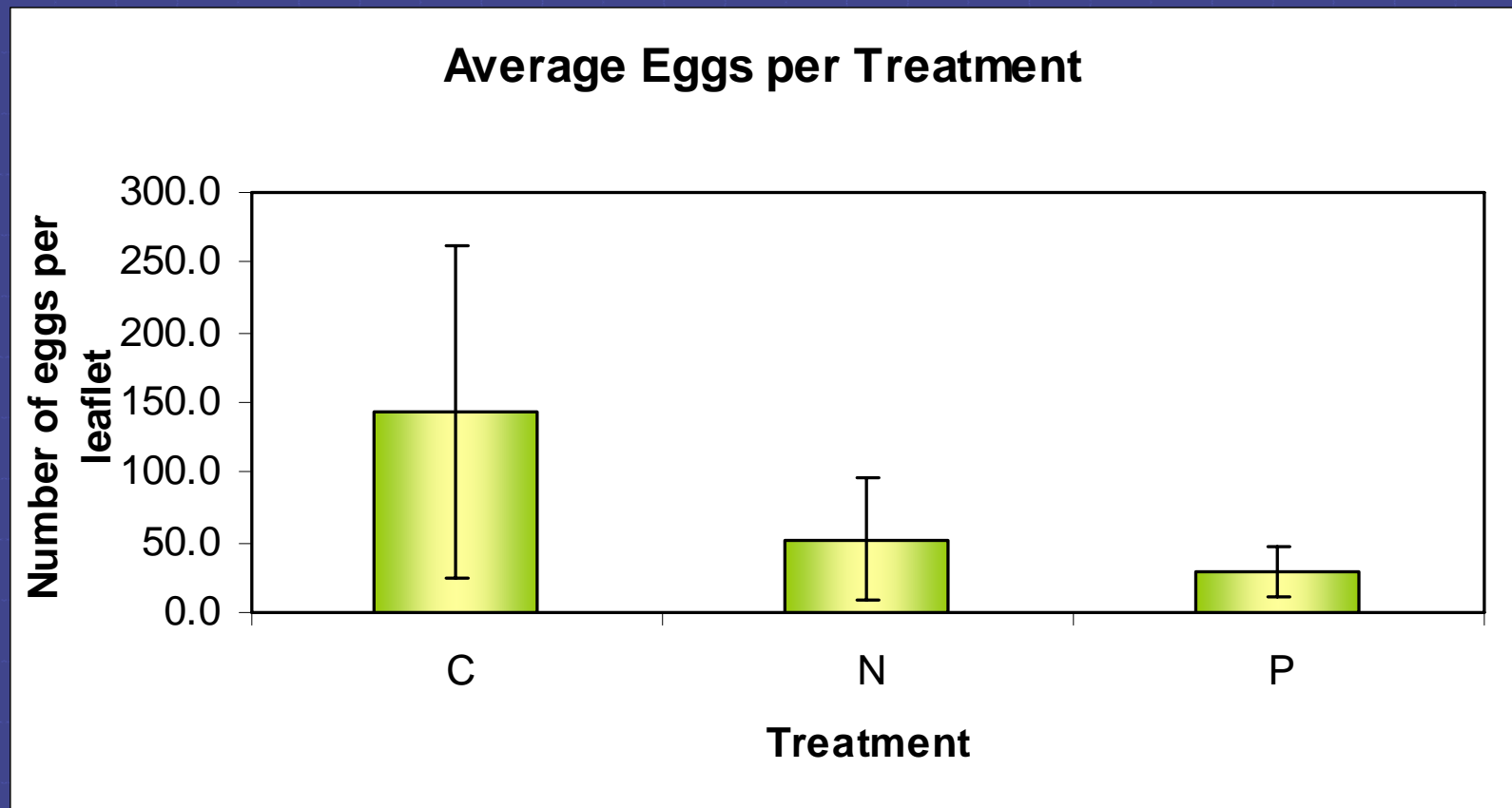


Average TSSM Motiles per Treatment per Week





Laboratory Results (Eggs)

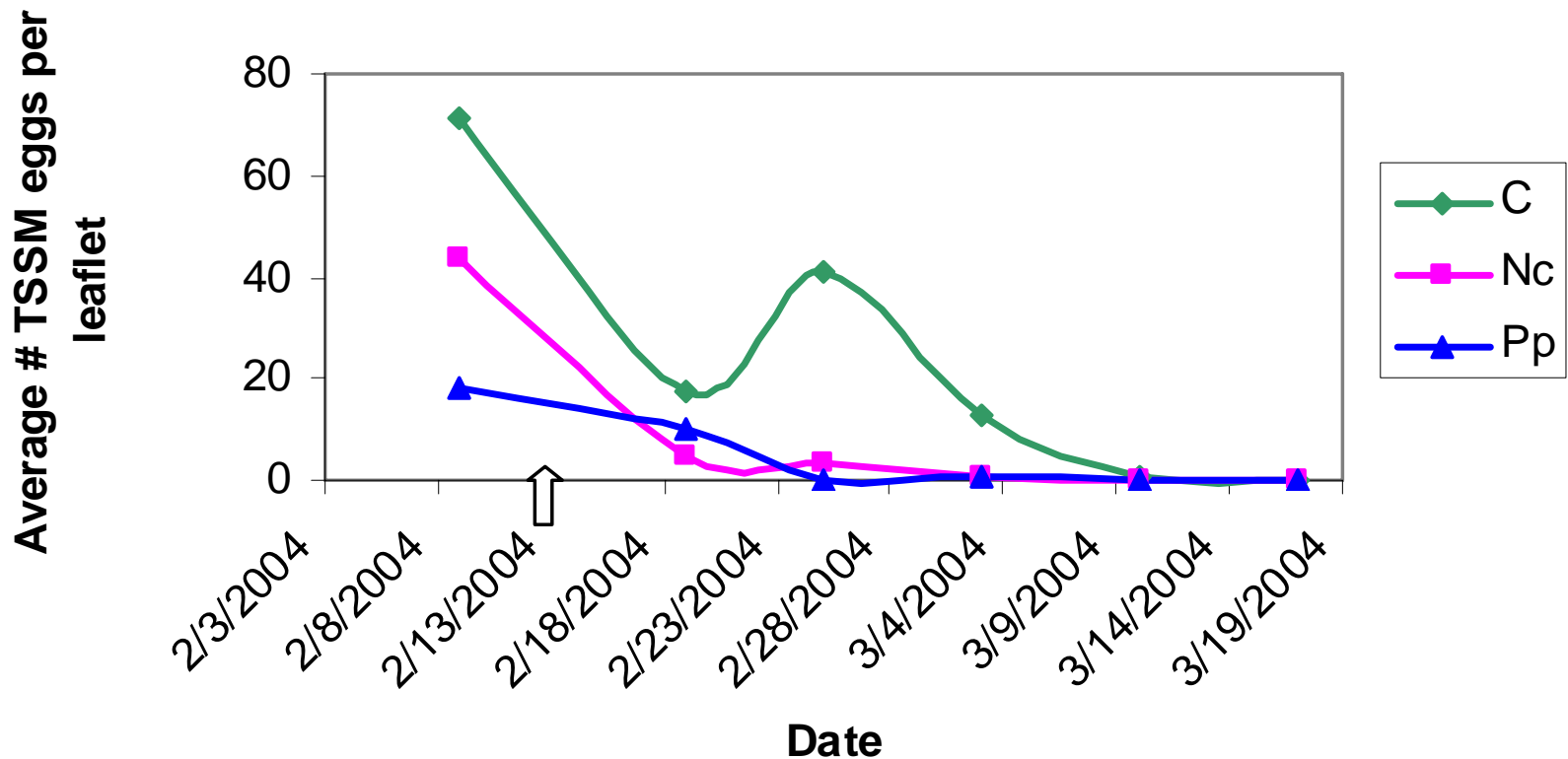


$F = 0.89$ $df = 2,8$ $P = 0.4471$



Laboratory Results (Eggs)

Average TSSM Eggs per Treatment per Week



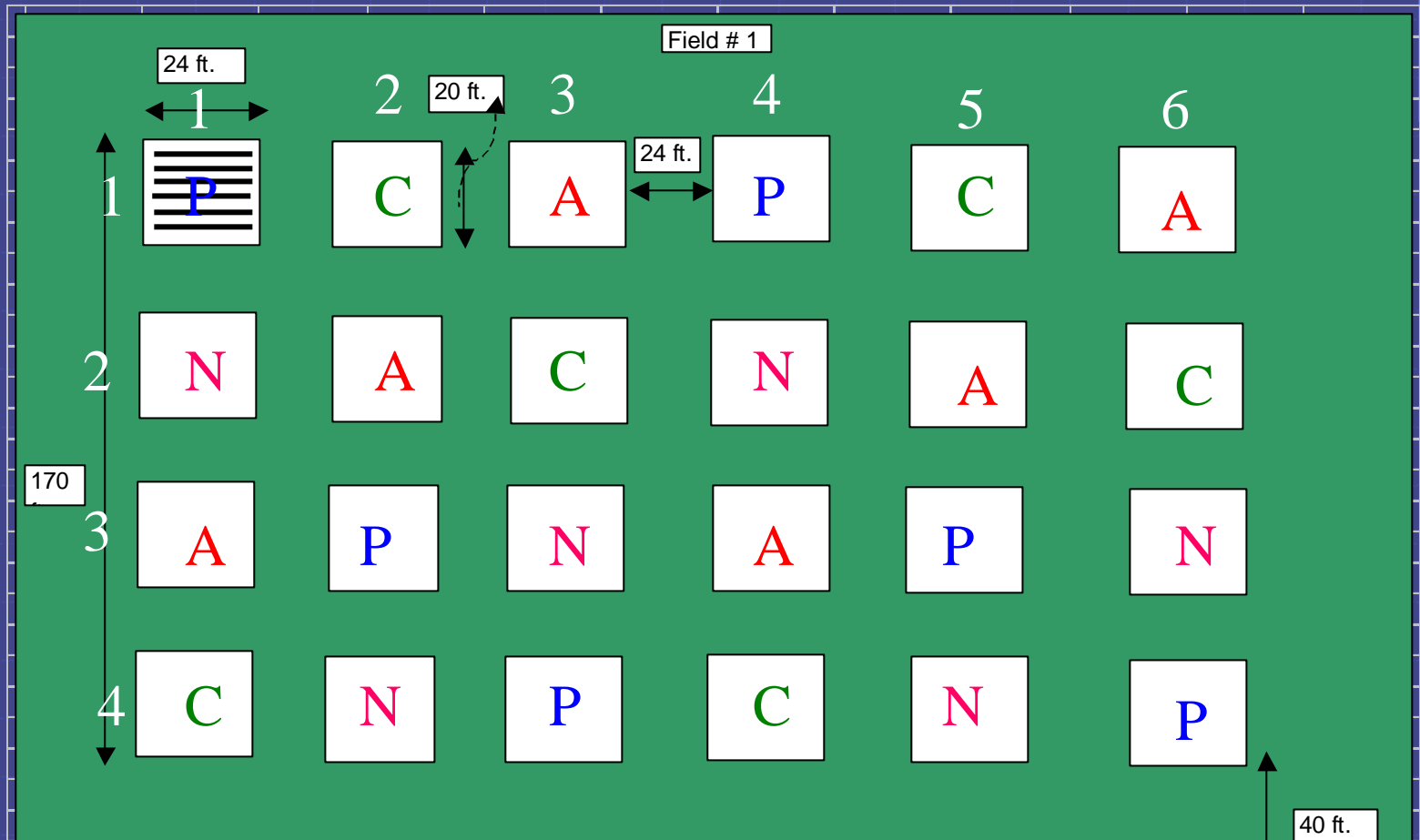


Conclusions (Laboratory)

- ◆ In laboratory experiments, neither *P. persimilis* nor *N. californicus* suppressed populations of TSSM on strawberry to a significant extent.



Methods (Field)



Methods (Field)



- ◆ Samples were taken once per week starting on 11/24/2003
 - 1 leaflet per row (6 leaflets per plot)

- ◆ Dates treatments were applied
 - 12/11/2003 & 2/11/2004: Predators released into N and P plots, at the rate of 1 predator for 10 TSSM



- 12/18/2003 & 2/14/2004: Acramite applied to A plots

Methods (Field)



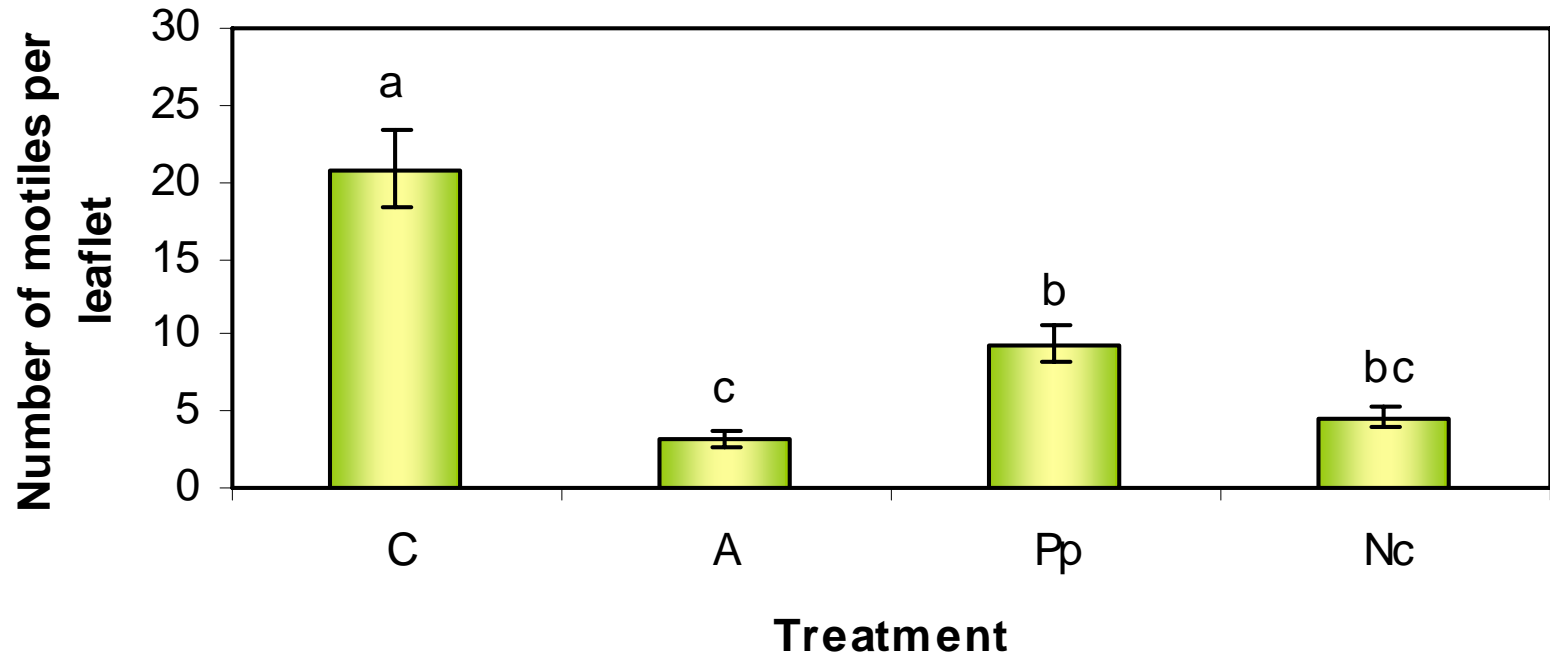
- ❖ Strawberries were harvested once a week beginning on 1/8/2004 and ending on 4/6/2004
- ❖ Yield data was collected from the four inner rows of each plot





Field Results (Motiles)

Average TSSM Motiles for the Season

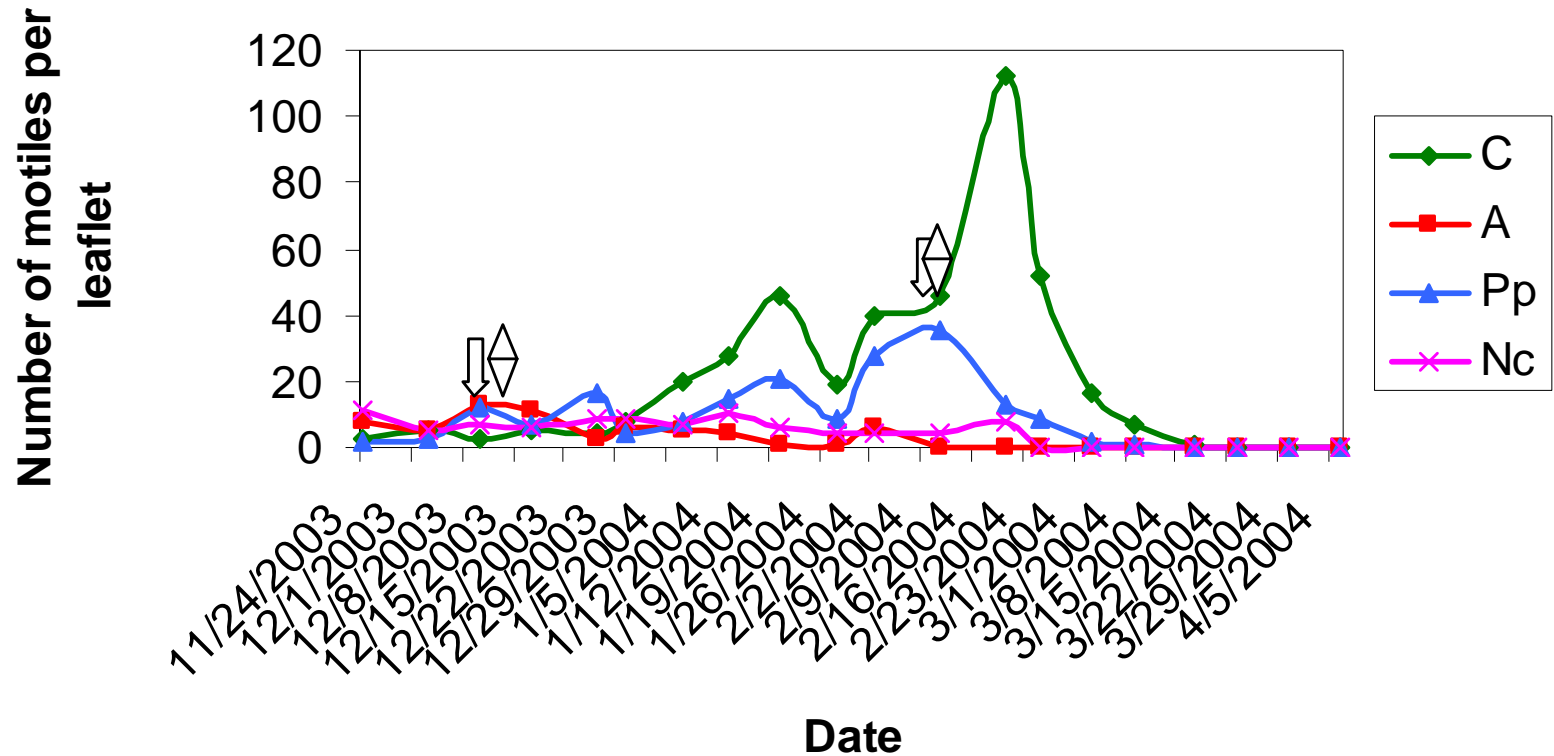


$F = 32.22$ $df = 3,2849$ $P < 0.0001$

Field Results (Motiles)



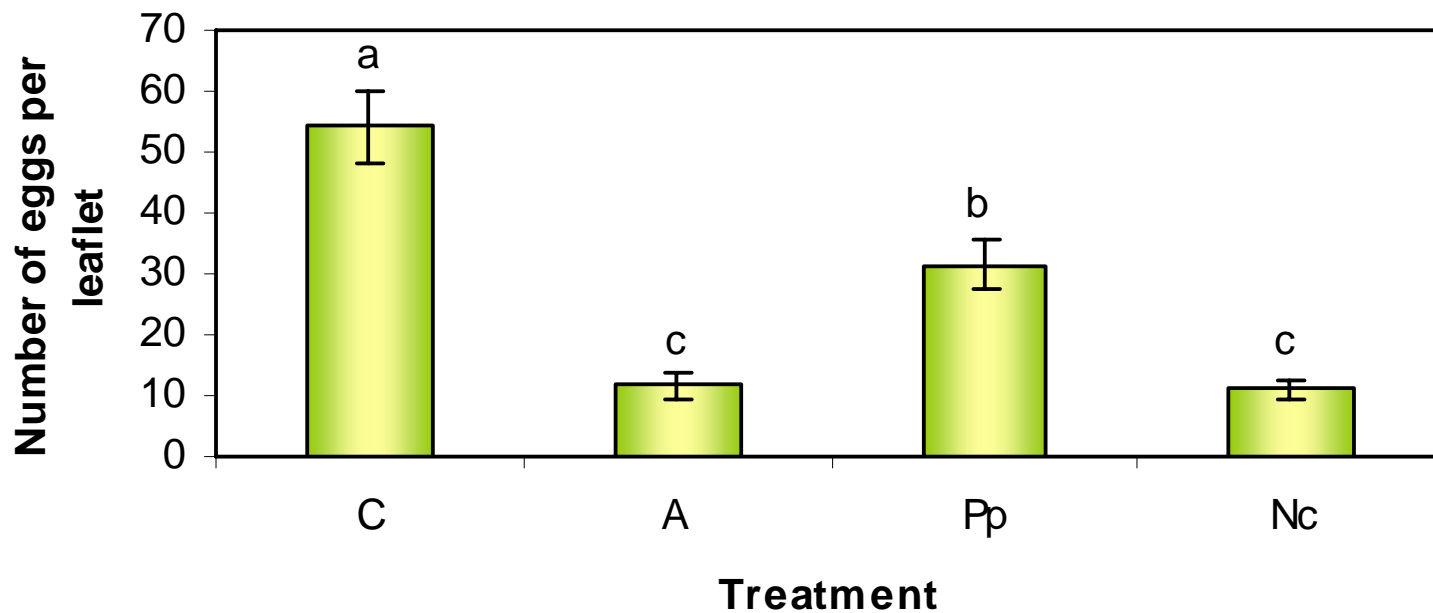
Weekly average of TSSM motiles per treatment





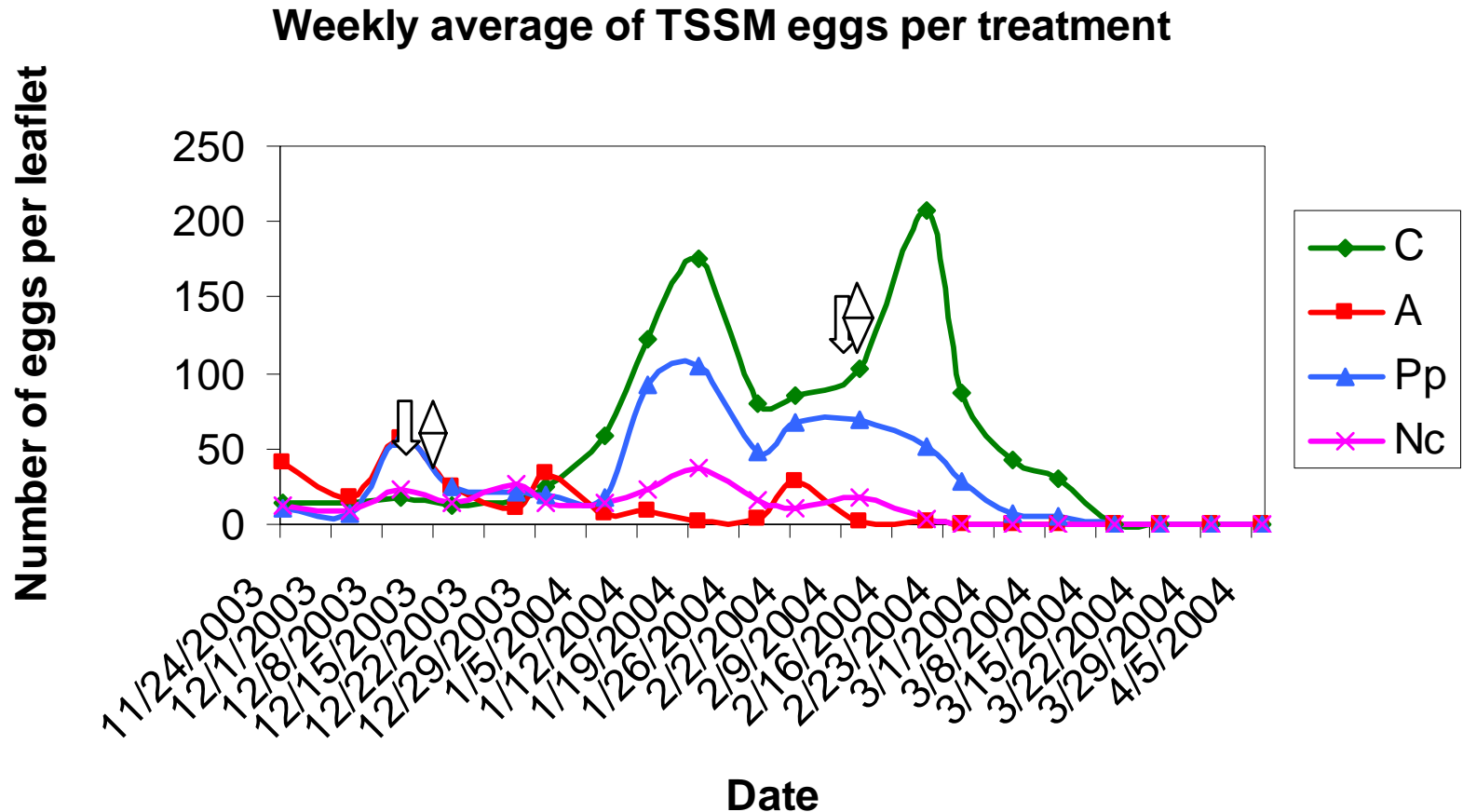
Field Results (Eggs)

Average TSSM eggs for the Season



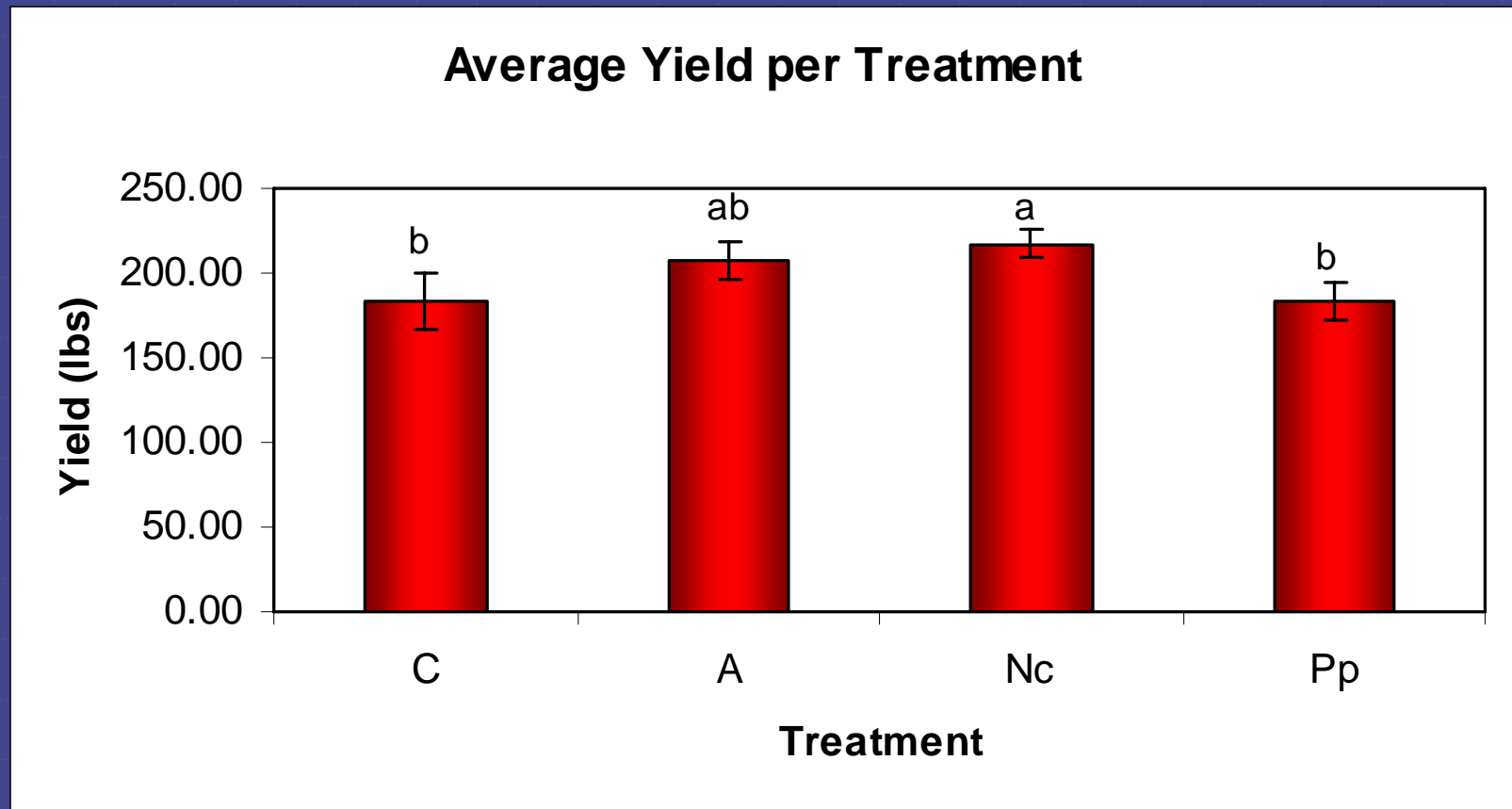
$F = 30.64$ $df = 3,2849$ $P < 0.0001$

Field Results (Eggs)





Field Results (Yield)



$F = 3.63$ $df = 3,15$ $P = 0.0376$



Conclusions (Field)

- ◆ Two applications of Acramite effectively controlled TSSM populations in the field
- ◆ *N. californicus* gave better control of TSSM populations in the field than did *P. persimilis*
- ◆ Late season yield was significantly higher in the *N. californicus* treated plots



Future Research

- ◆ To conduct more laboratory experiments evaluating the effects of *N. californicus* and *P. persimilis* on twospotted spider mites
- ◆ To study the effects of releasing *N. californicus* and *P. persimilis* as a single treatment on the population of twospotted spider mites as well as effects on the individual predator species
- ◆ To repeat field experiments in the upcoming 2004/2005 strawberry field season



Acknowledgements

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