Comparison of Single and Combination Treatments of *P. persimilis*, *N. californicus*, and Acramite for Control of Twospotted Spider Mite in Florida Strawberries

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Strawberry Production in Florida

- Ranks 2nd behind CA
- Produces 100% of the domestically grown winter strawberries
- 2,873 ha (7,100 acres)
- $178 million value

Twospotted Spider Mite (TSSM)

- *Tetranychus urticae* Koch
- Life cycle takes ~19 days and females can lay up to 100 eggs

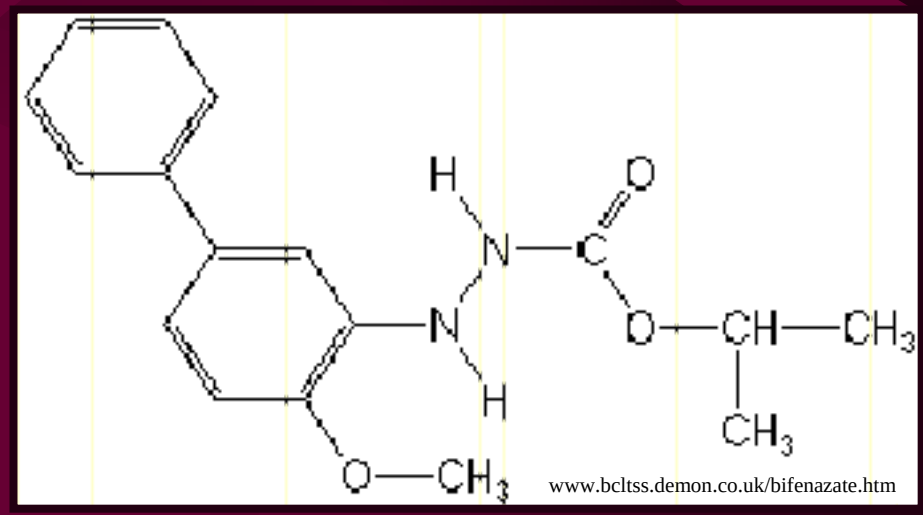
- Optimal conditions for development are high temperatures (up to 38°C) and low humidity
- Greenish-yellow and red forms

Control of TSSM

- Miticides
  - Acramite® (bifenazate)
- Predatory Mites
  - *Phytoseiulus persimilis* Athias-Henriot
  - *Neoseiulus californicus* (McGregor)

Acramite® (bifenazate)

- Reduced-risk pesticide
- Only 2 applications in a season
- 1.125 kg/ha (1 lb/acre)



Phytoseiulus persimilis Athias-Henriot

- Feed almost exclusively on *Tetranychus* mites
- Short developmental time, a non-feeding larval stage, and a high rate of fecundity

Neoseiulus californicus (McGregor)

- Prefer tetranychid mites but can subsist on other foods
- Short developmental time and a high rate of fecundity
- Larvae are facultative feeders

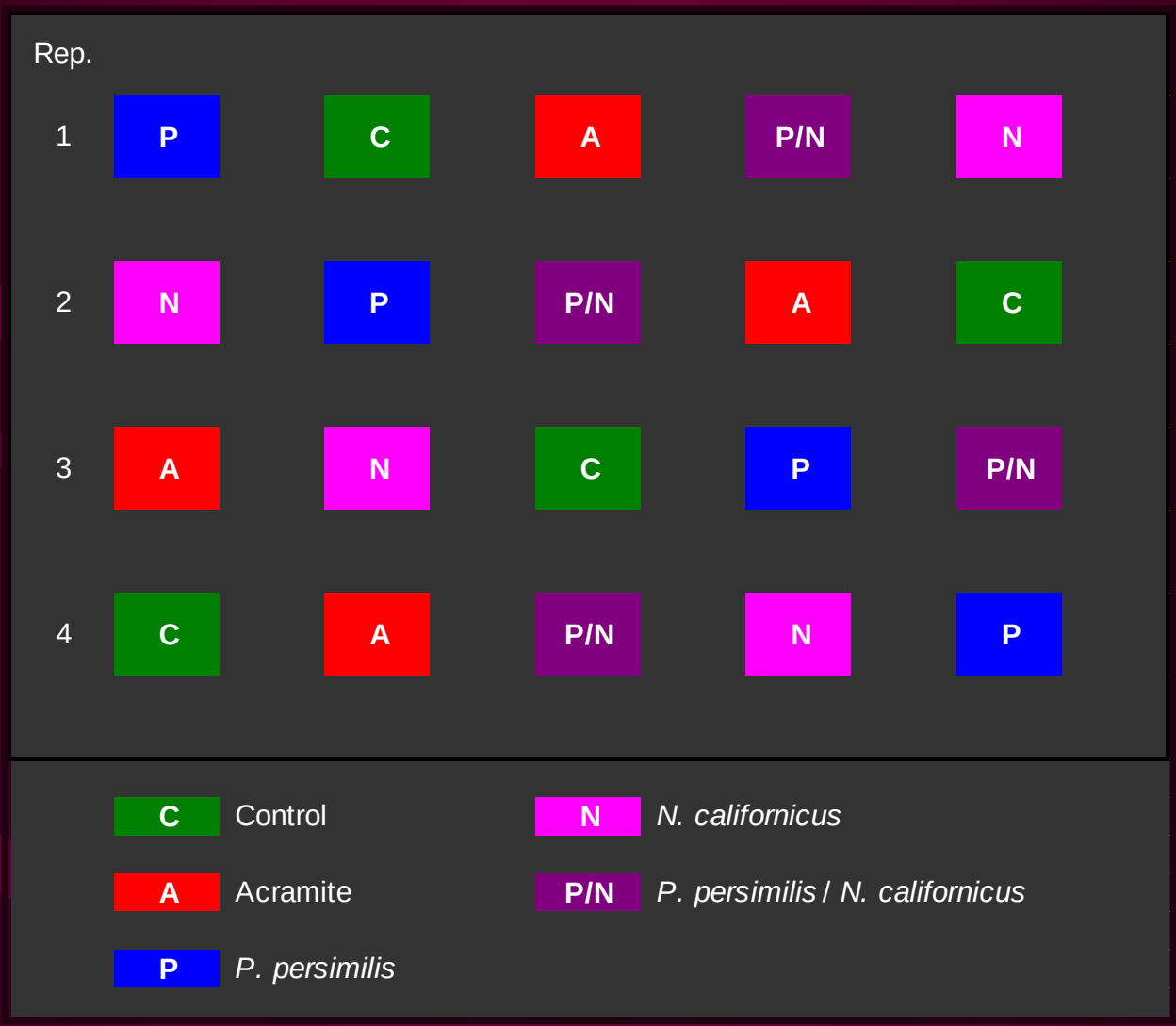
Goal

- To evaluate combination treatments of the two predatory mite species and Acramite for control of TSSM in Florida strawberries
- To compare these combination treatments to single treatment applications

Experiment 1

- 2003/ 2004 field season
- Plant Science Research and Education Unit in Citra, FL
- *P. persimilis/ N. californicus* combination

Methods

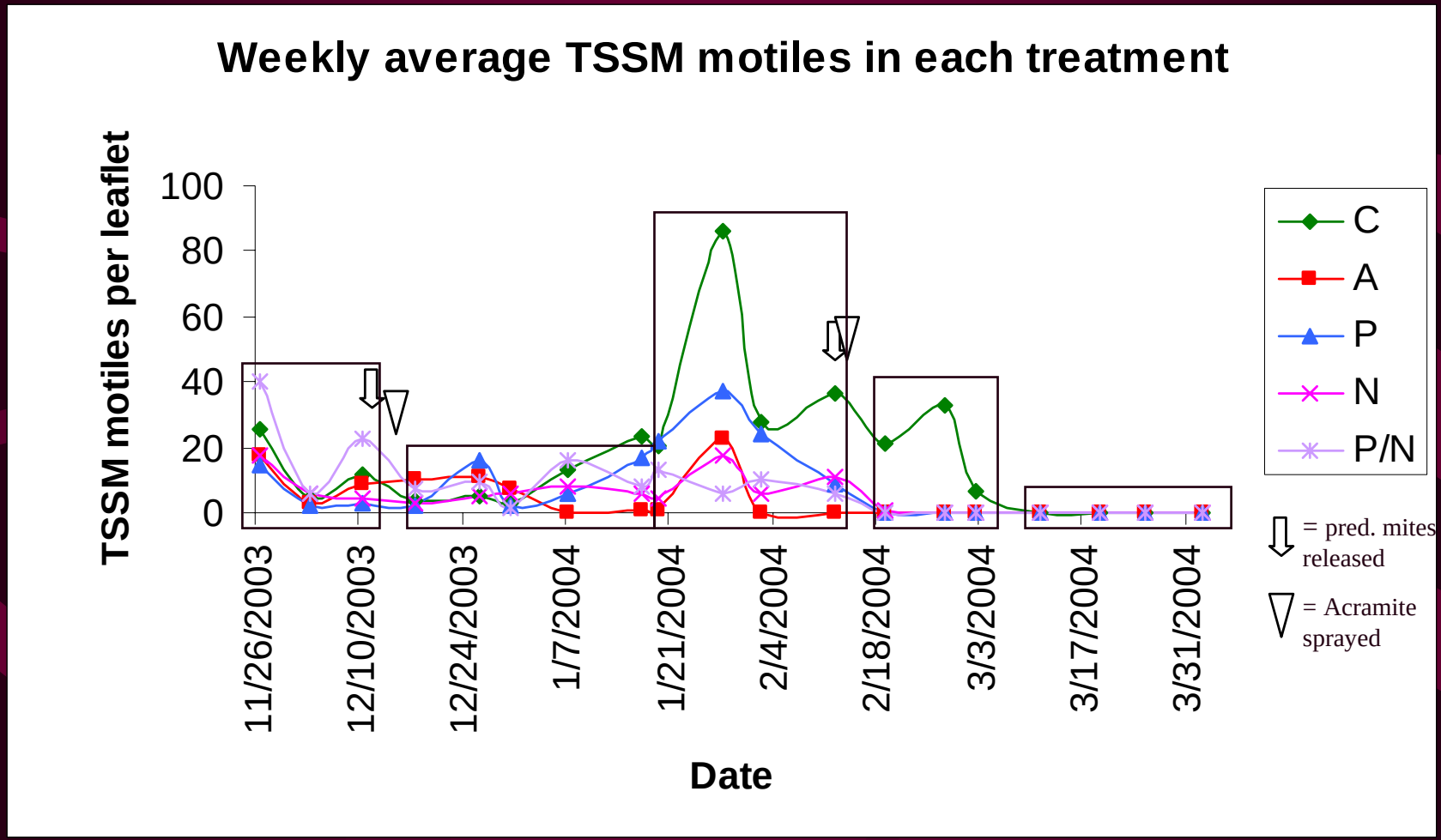

Rep.
1
P
C
A
P/N
N
2
N
P
P/N
A
C
3
A
N
C
P
P/N
4
C
A
P/N
N
P
C
Control
A
Acramite
P
P. persimilis
N
N. californicus
P/N
P. persimilis / N. californicus

Methods

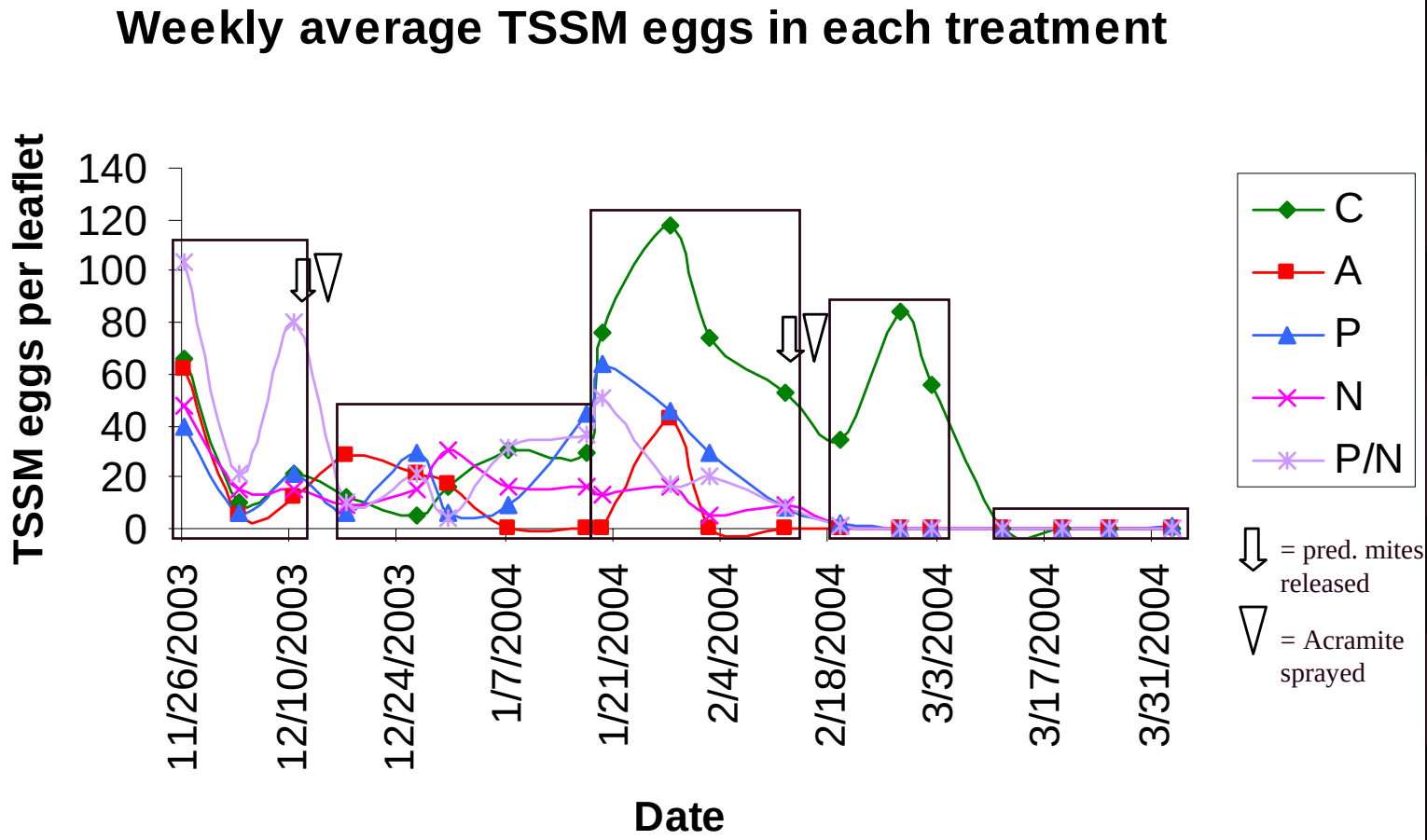
- Samples were taken once per week starting on 11/26/2003
  - 1 leaflet per row (6 leaflets per plot)
- Dates treatments were applied
  - Week of 12/11/03
  - Week of 2/11/04

- Both TSSM and predatory mites were counted

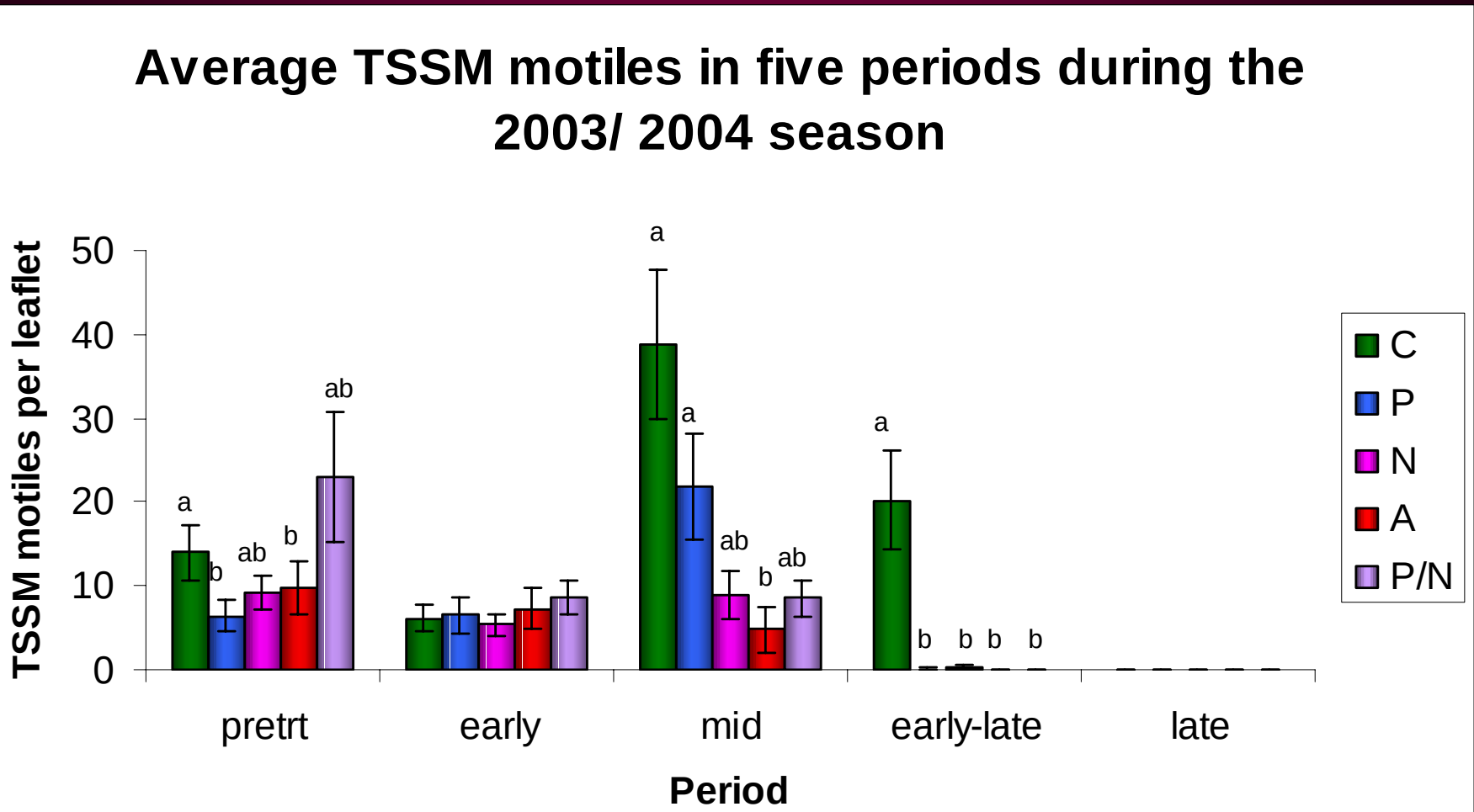
Results


Weekly average TSSM motiles in each treatment
TSSM motiles per leaflet
100
80
60
40
20
0
11/26/2003
12/10/2003
12/24/2003
1/7/2004
1/21/2004
2/4/2004
2/18/2004
3/3/2004
3/17/2004
3/31/2004
Date
C
A
P
N
P/N
= pred. mites released
= Acramite sprayed

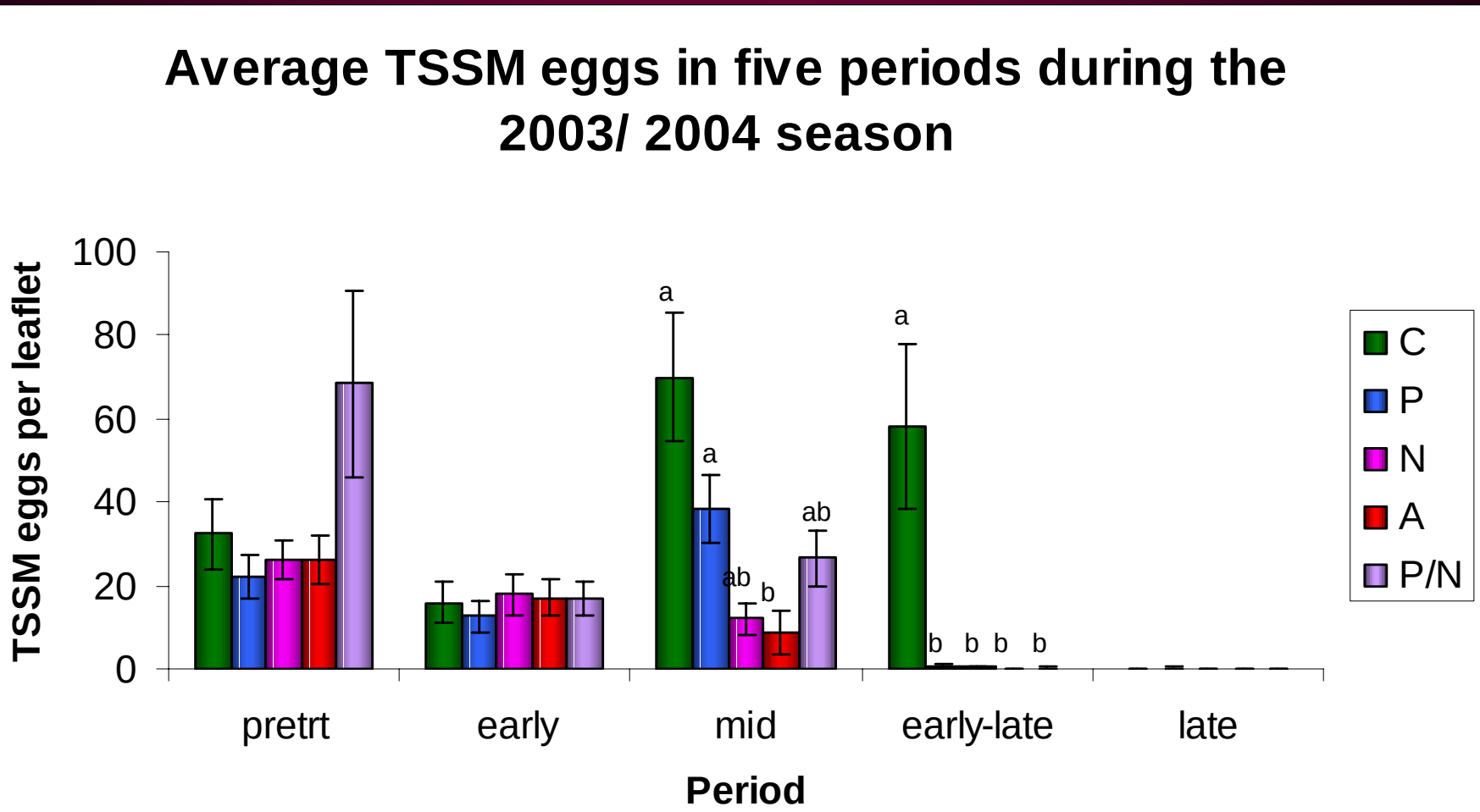
Results


Weekly average TSSM eggs in each treatment
TSSM eggs per leaflet
140
120
100
80
60
40
20
0
11/26/2003
12/10/2003
12/24/2003
1/7/2004
1/21/2004
2/4/2004
2/18/2004
3/3/2004
3/17/2004
3/31/2004
Date
C
A
P
N
P/N
= pred. mites released
= Acramite sprayed

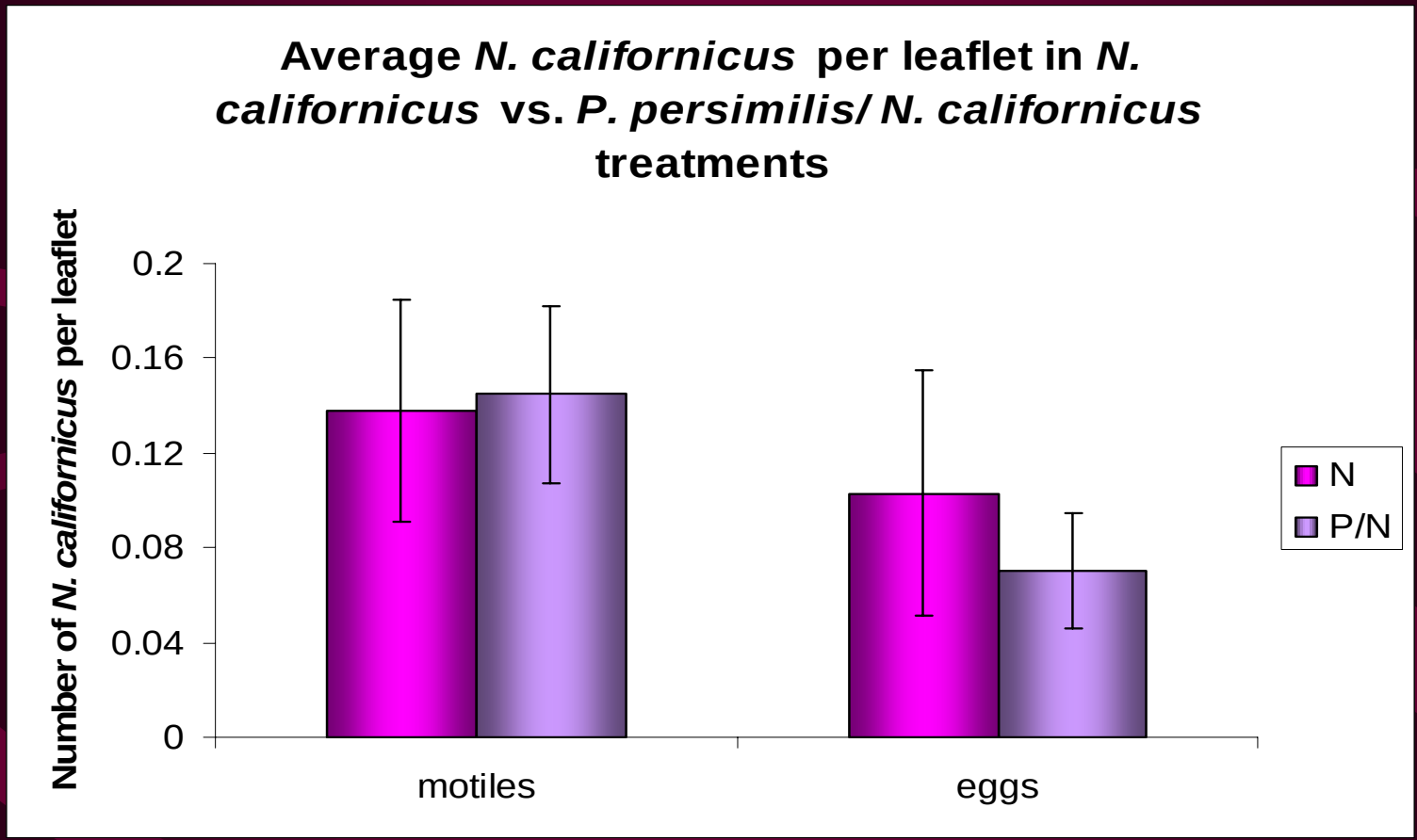
Results


Average TSSM motiles in five periods during the 2003/ 2004 season
TSSM motiles per leaflet
50
40
30
20
10
0
a
b
ab
b
ab
a
a
ab
b
ab
a
b
b
b
b
pretrt
early
mid
early-late
late
Period
C
P
N
A
P/N

Results

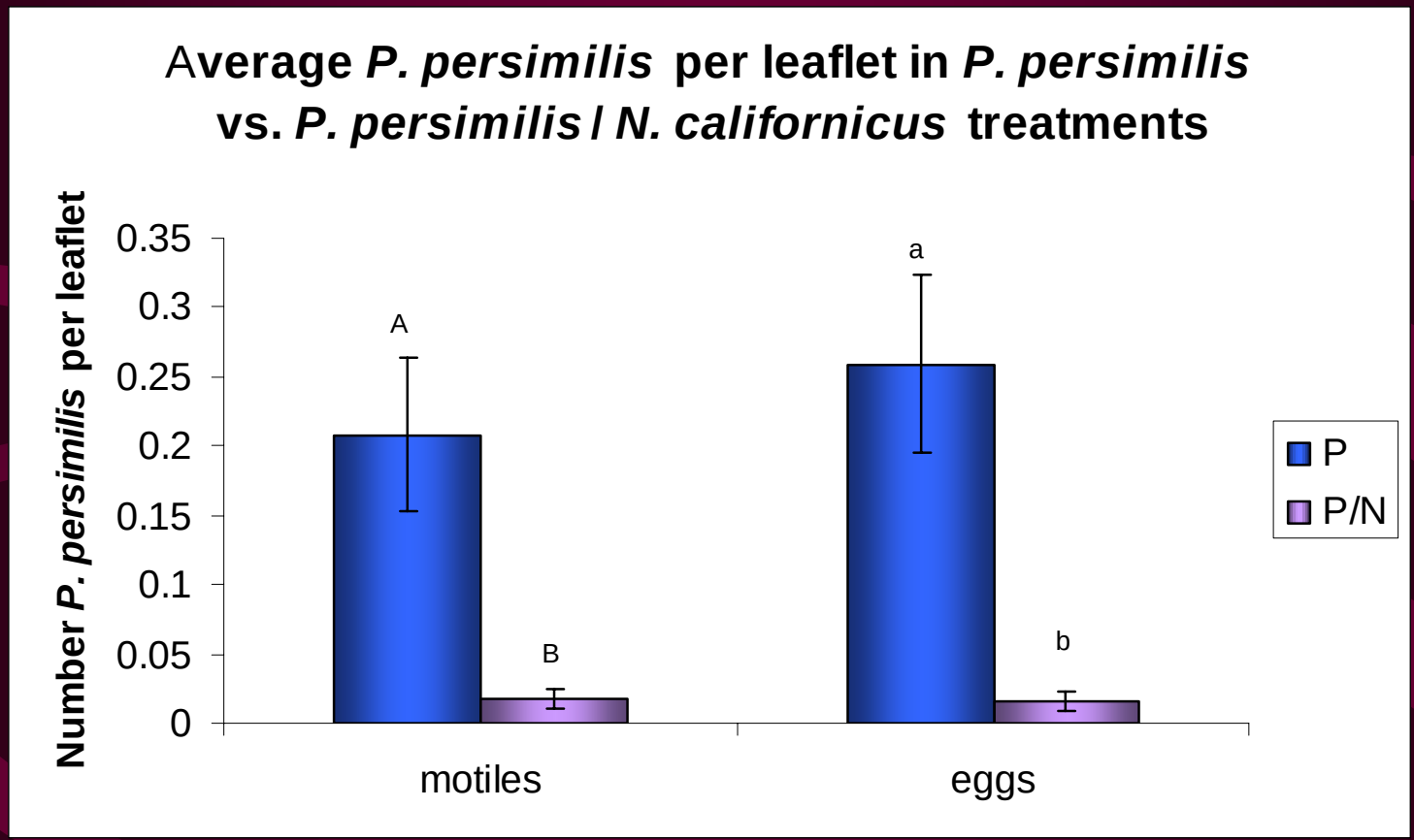

Average TSSM eggs in five periods during the 2003/ 2004 season
TSSM eggs per leaflet
100
80
60
40
20
0
a
a
ab
b
ab
a
b b b b
pretrt
early
mid
early-late
late
Period
C
P
N
A
P/N

Results



Motiles: $p = 0.4563$
eggs $p = 0.2837$

Results



Motiles: $p = 0.0004$
eggs: $p = 0.0001$

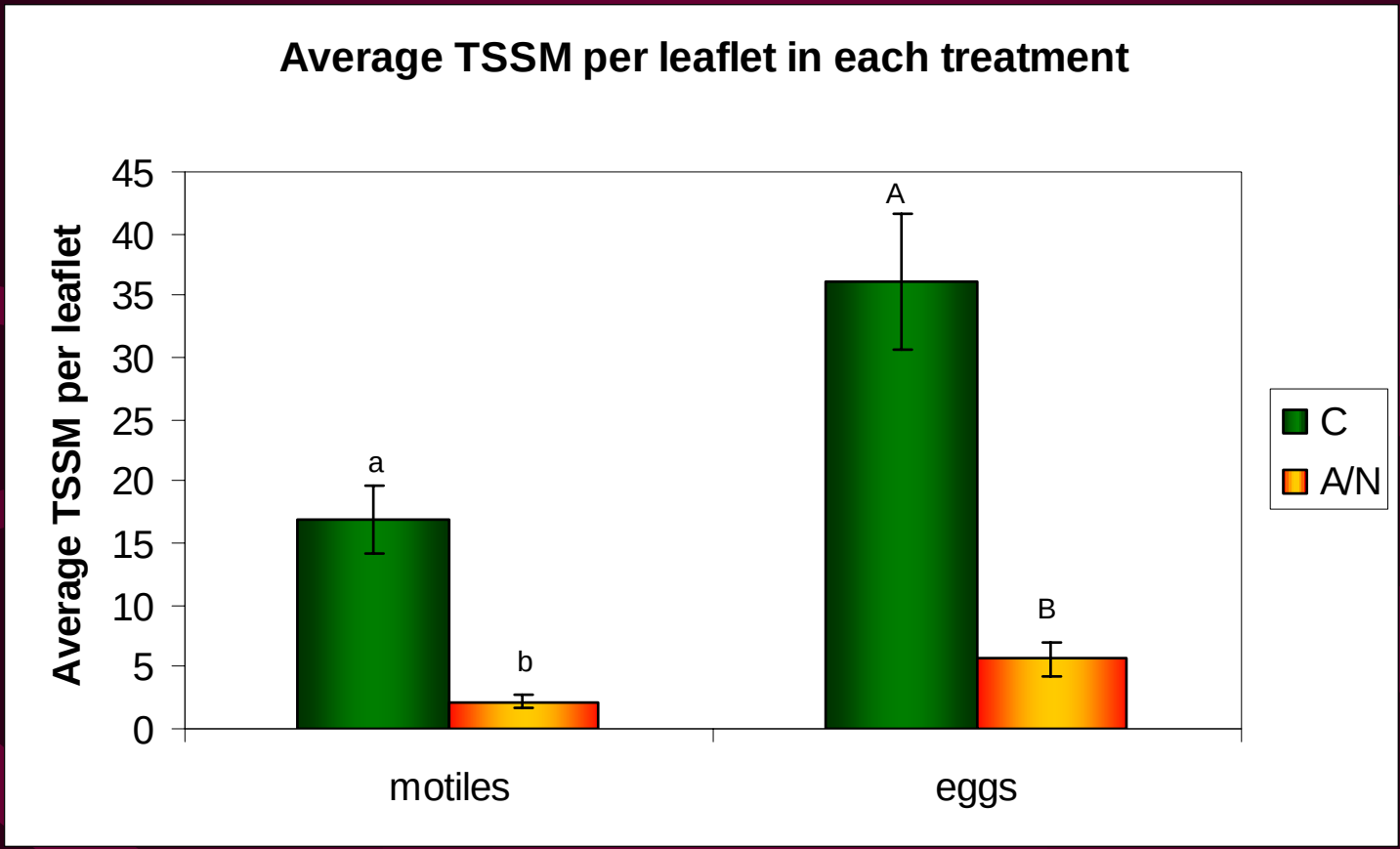
Experiment 2

- 2003/2004 field season
- Plant Science Research and Education Unit in Citra, FL
- Acramite/ *N. californicus* combination

Methods

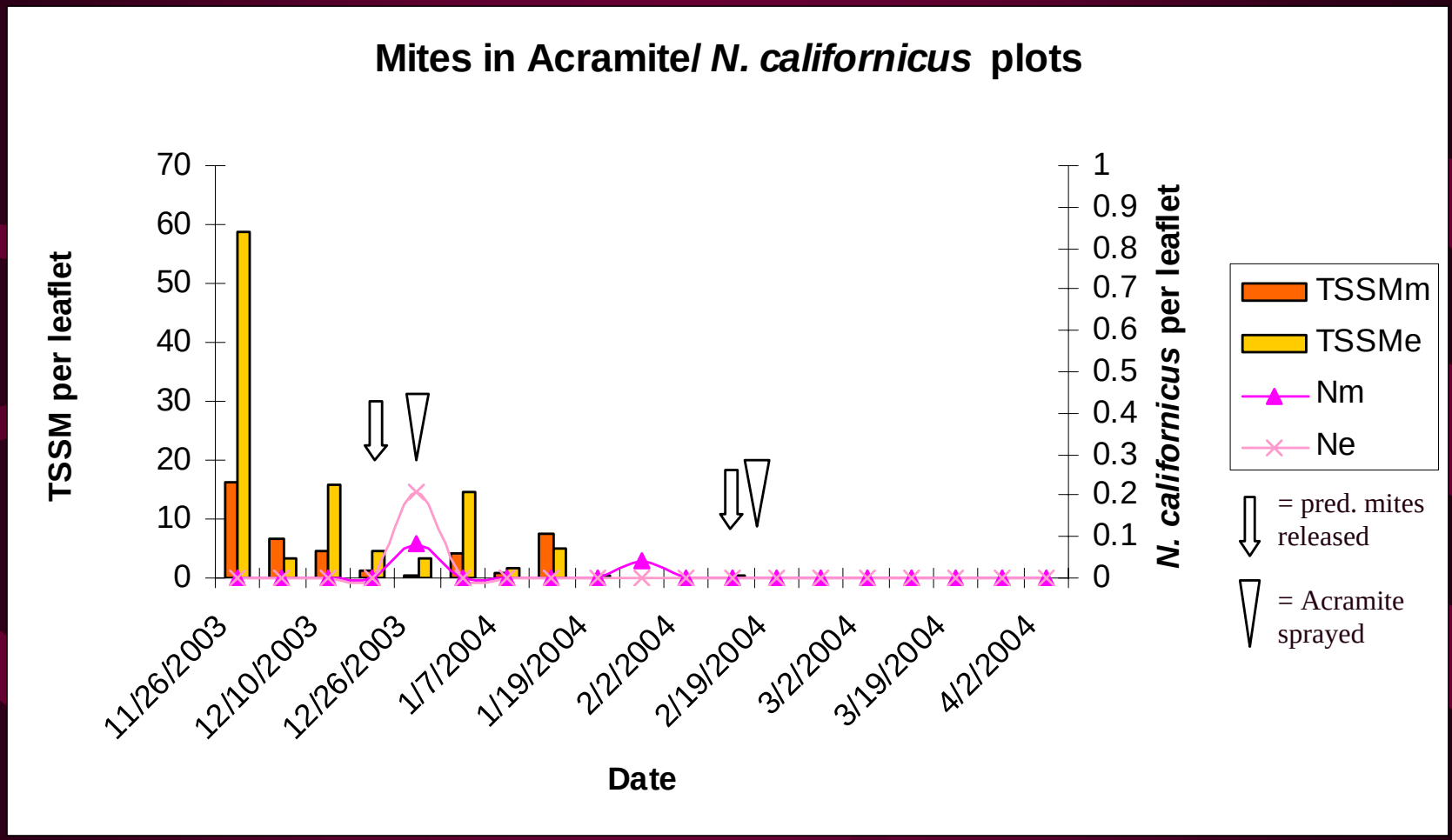
- Compared 4 Acramite/ *N. californicus* plots with 4 control plots
- Same sampling methods and treatment dates as in experiment 1
- Both TSSM and predatory mites were counted

Results



Control vs. Acramite/ *N. californicus* treatment
motiles: $p < 0.0001$
eggs: $p < 0.0001$

Results


Mites in Acramite/ N. californicus plots
TSSM per leaflet
N. californicus per leaflet
70
60
50
40
30
20
10
0
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
11/26/2003
12/10/2003
12/26/2003
1/7/2004
1/19/2004
2/2/2004
2/19/2004
3/2/2004
3/19/2004
4/2/2004
Date
TSSMm
TSSMe
Nm
Ne
= pred. mites released
= Acramite sprayed

Conclusions

- Releasing both species in combination does not appear to be significantly better than releasing *N. californicus* alone
- When using both species in combination, *N. californicus* may displace *P. persimilis*
- The Acramite/ *N. californicus* treatment appeared to effectively control TSSM
- The second application of the Acramite/ *N. californicus* treatment may have been unnecessary

Acknowledgements

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