Control of broad mite, whitefly and spider mites in open field pepper and eggplant with predaceous mites (Phytoseiidae)

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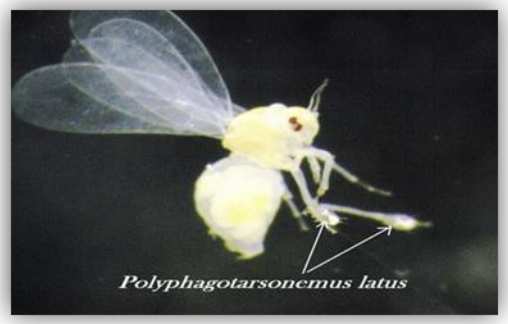
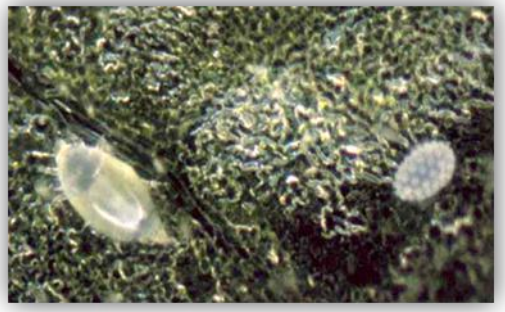
INTRODUCTION

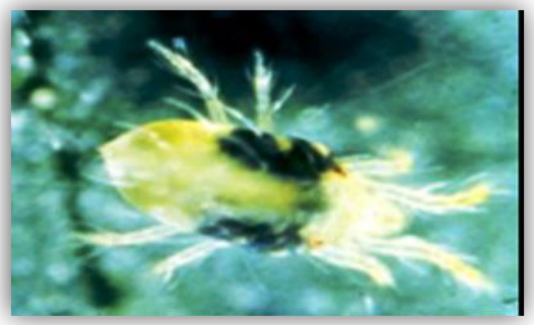
Whitefly
Bemisia tabaci



Broadmite
Polyphagotarsonemus latus



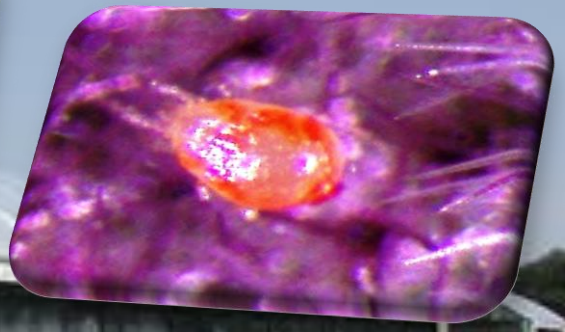
Spidermite *Tetranychus urticae*
T. evansi



Neoseiulus cucumeris

Amblyseius swirskii

Neoseiulus californicus



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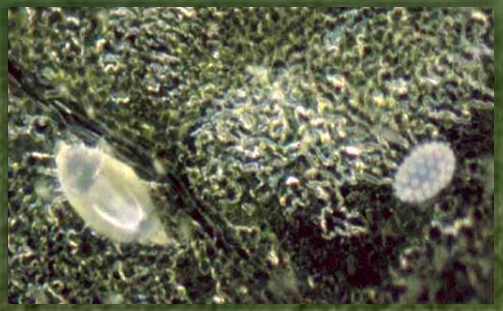


Whitefly
Bemisia tabaci

Spidermite
Tetranychus urticae

OBJECTIVE

Test the efficacy of predaceous mites to control pepper and eggplant pests in open field.

Four experiments were conducted to compare individual and combined action of the phytoseid species.

1. Release *N. cucumeris* in a commercial Bell pepper to control broadmite.

2. Compare *N. cucumeris* with *A. swirskii* to control broadmite in Serrano pepper.

3. Observe the action of *A. swirskii* on whitefly and broadmite in eggplant "Zebra" and compare with Chemical control.

4. Compare the action of *A. swirskii* and *N. californicus* on broadmite, whitefly and spider mite in eggplant "Classic" and Jalapeño pepper.

1. Release *N. cucumeris* in a commercial Bell pepper field to control broadmite.

Methods:

A demonstration experiment conducted in a block of bell pepper at a farm. Seven beds untreated and 7 beds treated by the grower with acaricides or insecticides at his discretion.

Plots, each designated at random either for predator release or untreated in a replicated complete block design.

Bran mixture with *T. putrescentiae* (from our laboratory colony) containing 16 – 18 adult of *N. cucumeris* /cm³ were evenly distributed over all the plants in the plots designated for treatment.

Tyrophagus putrescentiae in bran to feed *N. cucumeris*

One leaf per plant from 10 plants at random from each untreated and treated plot. Number of eggs, nymphs and adults of broadmite were noted at the microscope

A professional scouting service monitored the same plots and 3 additional plots but treated by the grower with pesticide, from10 plants per plot using a rating system of 0, 1, 2 to 3 mites per leaf, just in place with a loupe.

Results

Broadmite per leaf

Treatment	Mean (stderr) mites (N = 210).			
	Egg	**Nymph**	**Adult**	**Total**
Release	a 3.3 (0.6)	a 1.0 (0.2)	a 1.0 (0.2)	a 5.4 (0.9)
No release	b 9.5 (1.3)	b 3.1 (0.4)	b 2.3 (0.3)	b 14.9 (1.9)

Rating system by farmer

Treatment	Mean (Stderr) ranking N=180
Release	a 0.05 (0.02)
No release	b 0.36 (0.06)
Grower Standard	a 0.09 (0.02)

Means followed by the same letter within the same column are not significantly different (t Test LSD; $P<0.001$)

2. Compare *N. cucumeris* with *A. swirskii* (Provide by Koppert) to control broadmite in Serrano pepper.

Cucumeris	Control	*Swirskii*
Swirskii	**Cucumeris**	Control
Control	*Swirskii*	**Cucumeris**

Methods

A Latin square design of 3 treatments with 3 replications per treatment and 40 plants plot.

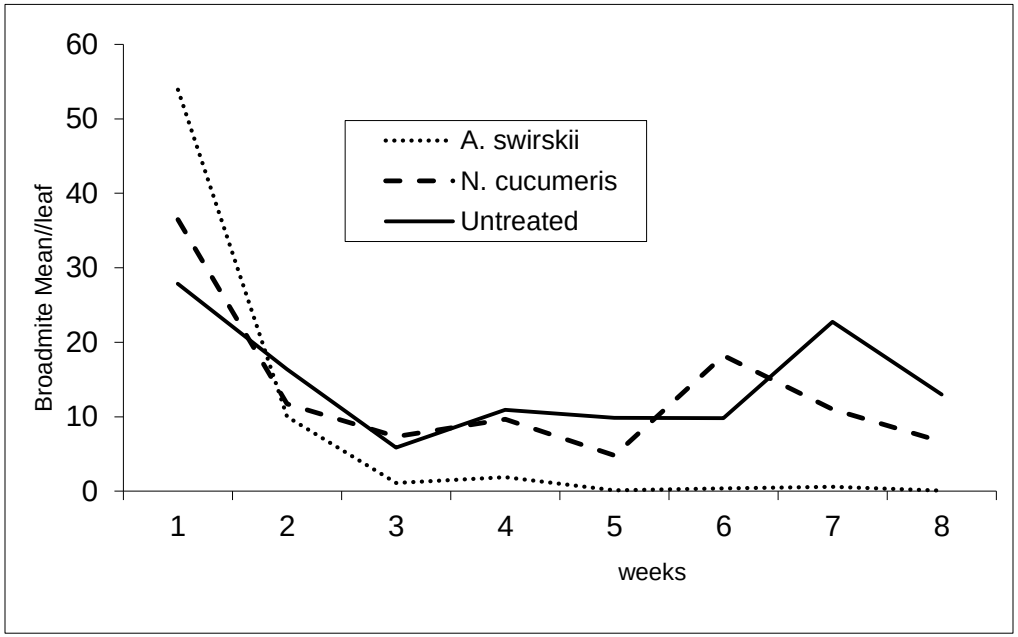
The two species of predator mites were release simultaneously (5 cm3 of bran/plant) on each of two predator treatment.

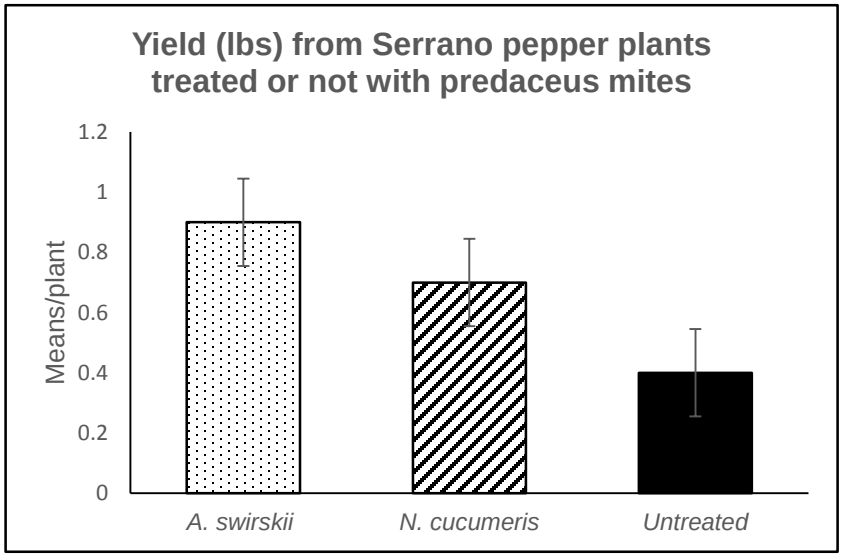
A second release of *A. swirskii* was made 2 weeks after. *N. cucumeris* continued to be released weekly until the end of the experiment.

Broadmite populations were monitored weekly from 5 leaves per plot counting eggs, nymphs and adults under the Microscope.

2. Compare *N. cucumeris* with *A. swirskii* to control broadmite in Serrano pepper.

Results

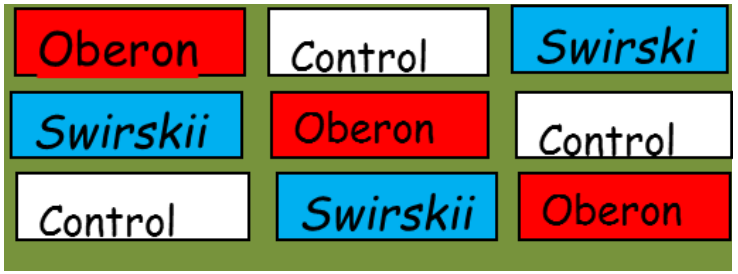




3. Observe the action of *A. swirskii* on whitefly and broadmite in eggplant "Zebra" and compare with Chemical control

Methods

- A Latin square design of 3 treatments with 3 replications per treatment with 15 plants per plot at 18 inches spacing.



- Oberon (spiromesifen) applied twice as a foliar spray at 8.5 oz/ac one and two weeks later.

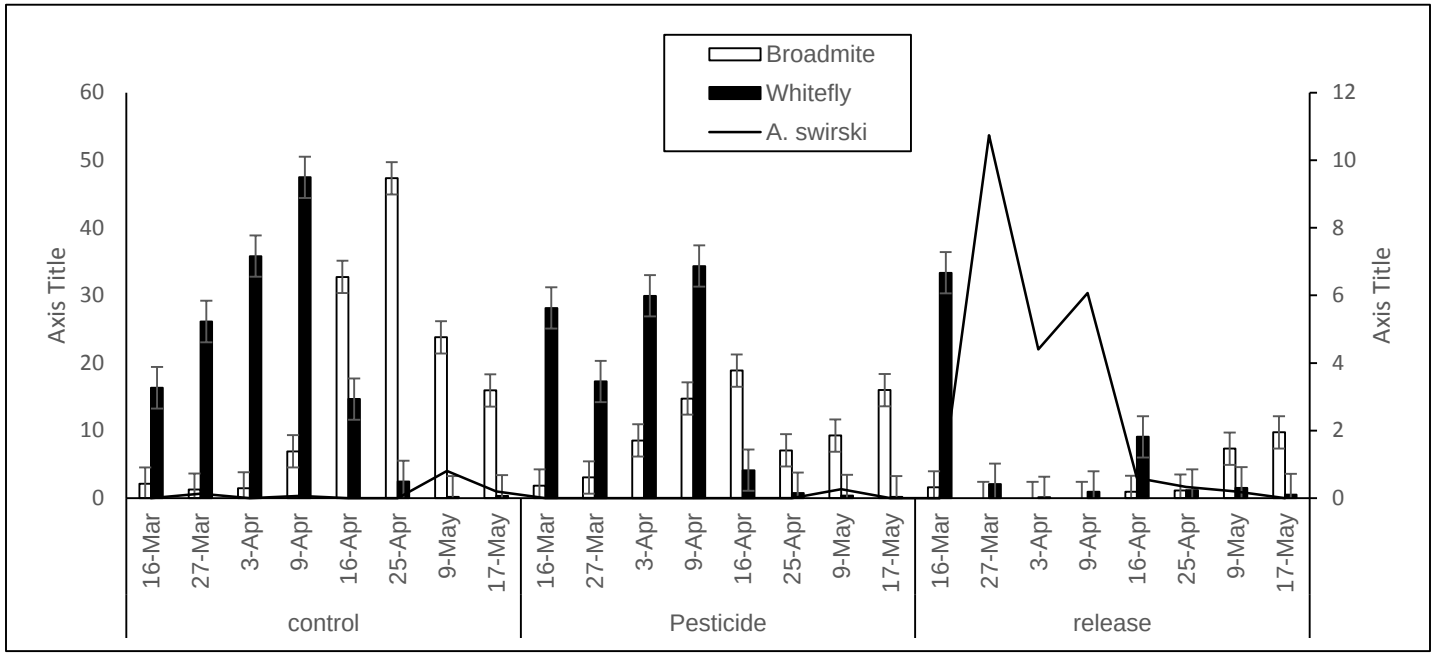
- One sachet of predator mites (=250 individuals) was released per m².

- 5 top eggplant leaves/plot, one per plant were sampled weekly and eggs, nymphs and adults of broadmite and predator mites were counted as well as eggs and nymphs of whitefly

- All fruit of marketable size was harvested from 5 eggplants per plot. Fruits were counted, weighed and evaluated for russeting injury, scale of 0 to 3.

3. Observe the action of *A. swirskii* on whitefly and broadmite in eggplant "Zebra" and compare with Chemical control

Results

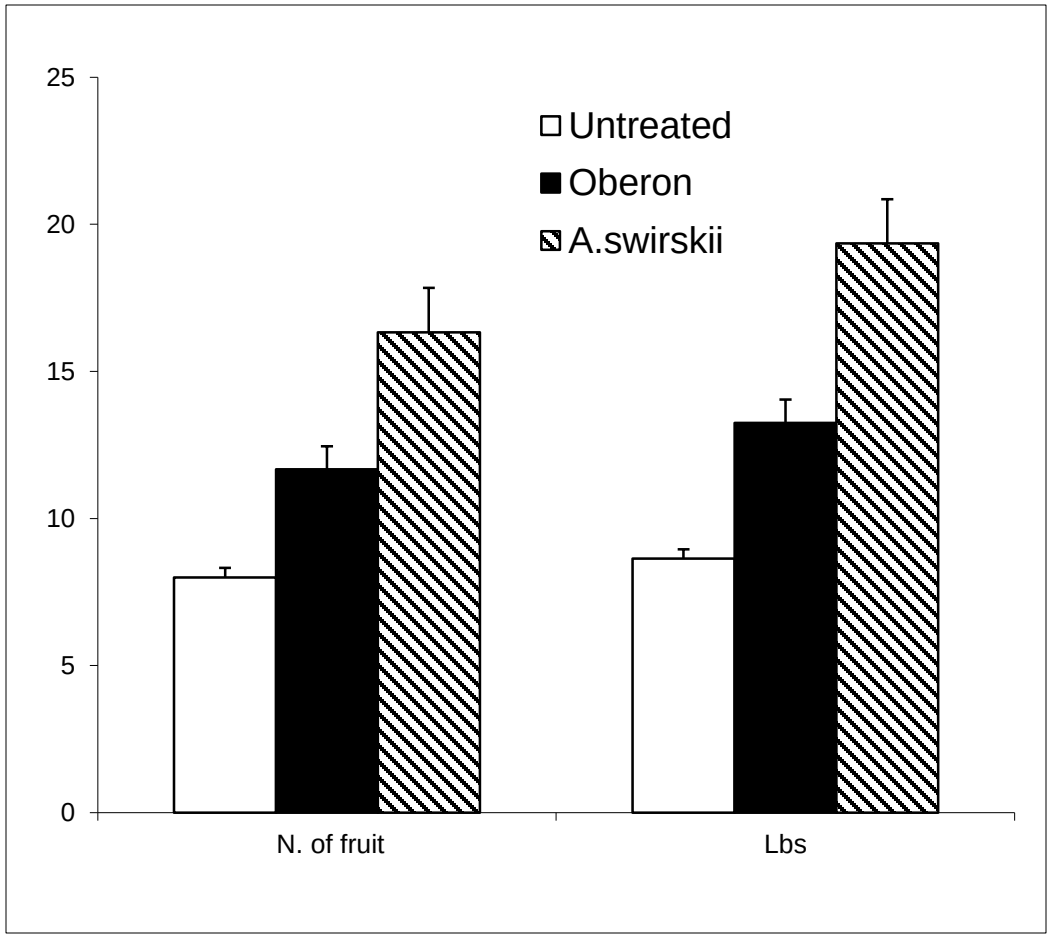


Treatment	Broadmites	Whiteflies
Control (Untreated)	16.5a	17.9a
Oberon	9.9b	14.4a
Release	2.6c	6.1b

PROC GLM with treatment differences determined by t Tests (LSD) at $P < 0.05$

Results

Yield (Number of fruits & lbs) from eggplant with three treatments.

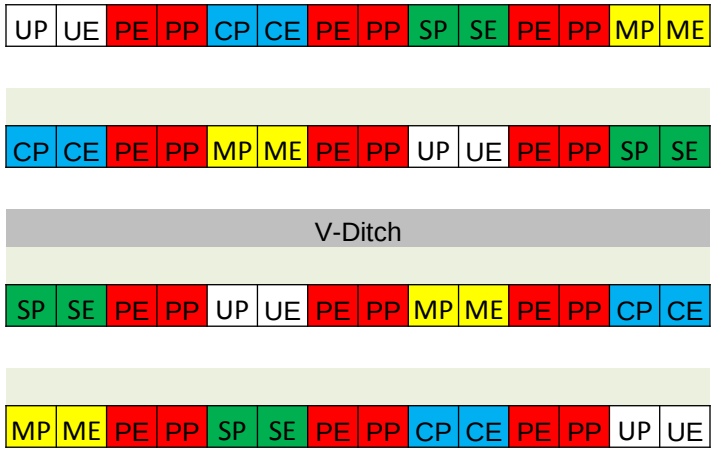


Russeting Damage Rating (0-3)	
Untreated	1.9 ±0.2a
Oberon	1.6 ±0.6a
A. Swirskii	0.5 ±0.3b

4. Compare the action of *A. swirskii* and *N. californicus* on broadmite, whitefly and spider mite in **eggplant** "Classic" and Jalapeño **pepper**.

Methods

- Completely randomized split plot design , 4 replications.
- Plots consisted of 14 plants set 60 cm apart.
- Buffer plots to separated treatments treated with a pesticide (P=Movento-abamectin).
- Four treatments: swirskii alone (S), californicus alone (C), mixes of swirskii and californicus (M) and Untreated (U)



- Release at 50 m^{-2} and 100 m^{-2} per plant for *A. swirskii* and *N. californicus* respectively (Koppert "curative light").


A. swirskii

N. californicus

- Sampling six leaves (three top and three basal) from six randomly selected plants per plot.

Results

Eggplant

Treatment	Broad Mite	Whitefly	Spider Mite	
Control	9.59 ± 2.02 a	8.78 ± 2.47 a	3.20 ± 1.64	a
A. swirskii	0.48 ± 0.12 c	4.47 ± 1.22 b	0.07 ± 0.01	b
N. californicus	4.45 ± 1.11 b	6.48 ± 1.71ab	0.02 ± 0.02	b
A. swirskii + *N. californicus*	0.37 ± 0.10 c	4.91 ± 1.17 b	0.06 ± 0.04	b
Movento®/Abba	3.77 ± 1.00 b	1.66 ± 0.50 c	0.05 ± 0.05	b

Pepper

Treatment	Broad Mite	Whitefly
Control	9.27 ± 1.95 a	1.58 ± 0.43 a
A. swirskii	0.06 ± 0.04 c	0.87 ± 0.23 b
N. californicus	1.50 ± 0.44	1.43 ± 0.40 a
A. swirskii + *N. californicus*	0.09 ± 0.03 c	0.98 ± 1.17 b
Movento®/Abba	3.14 ± 0.84 b	0.62 ± 0.50 b

PROC GLM with treatment differences determined by t Tests (LSD) at $P < 0.05$

Conclusions:

- *Neoseiulus cucumeris* can exert significant control of broad mites, although many more applications are necessary to accomplish this than with *A. swirskii* due to the ability of this mite to persist on the plants.

- *A. swirskii*, usually used to control whitefly in greenhouse crops, control also broad mite in field pepper and eggplant with a very high efficiency, more than *N. cucumeris*.

- Although *A. swirskii* provided satisfactory control of the broad mite and whitefly, control of spider mites appeared to be better by *N. californicus*.

- The action of *A. swirskii* alone on populations of whitefly and broadmite in eggplant was much better than that of the pesticide Oberon (spiromesifen) applied twice as a foliar spray. Also, yield was greatest from plants treated by *A. swirskii*, least on plants treated with the pesticide 'Oberon', and significative least on plants untreated.

- Our results suggest that both predacious mites should be released where spider mites are expected to be the main problem, whereas *swirskii* alone would be the best choice to control whitefly and broad mite.

- These excellent results should stimulate extension agents and consultants to recommend biological control as a viable option for management of these pests in open-field fruiting vegetable production.

References

- Stansly, PA.; Castillo, JA.; Tansey, JA.; Kostyk, BC. 2018 Israel Journal of Entomology: 48 pp. 83–111
- Denmark HA, Evans GA. 2011. Phytoseiidae of North America and Hawaii (Acari: Mesostigmata). West Bloomfield (MI): Indira Publishing House. p. 451.

Acknowledgments

Barry Kostyk

Robert Riefer

for field technical support

Mauricio Pinto

for laboratory technical assistance

MOVENTO®

Oberon®

SWIRSKI-MITE

SPICAL (Neoseiulus californicus)