Comparison of *Transeius montdorensis* to other phytoseiid mites for the short-season suppression of thrips on greenhouse pepper crops

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Thrips suppression by phytoseiid mites

- Western flower thrips, *Frankliniella occidentalis* continue to be a major pest of greenhouse pepper crops globally:
  - Disease vector
  - Multi-resistant
  - In need of new management tools

- Phytoseiid mites are top predators of thrips:
  - Prime exploiters of foliar habitats (McMurtry, 2010).
  - Well adapted to pepper and other crops (McMurtry, 2015).
  - However, performance of mites can vary seasonally on a species basis.

Phytoseiid mites need to be compared together under different climatic and photoperiodic conditions.

Predatory phytoseiids available in North America

Neoseiulus cucumeris

Amblyseius swirskii

Amblydromalus limonicus

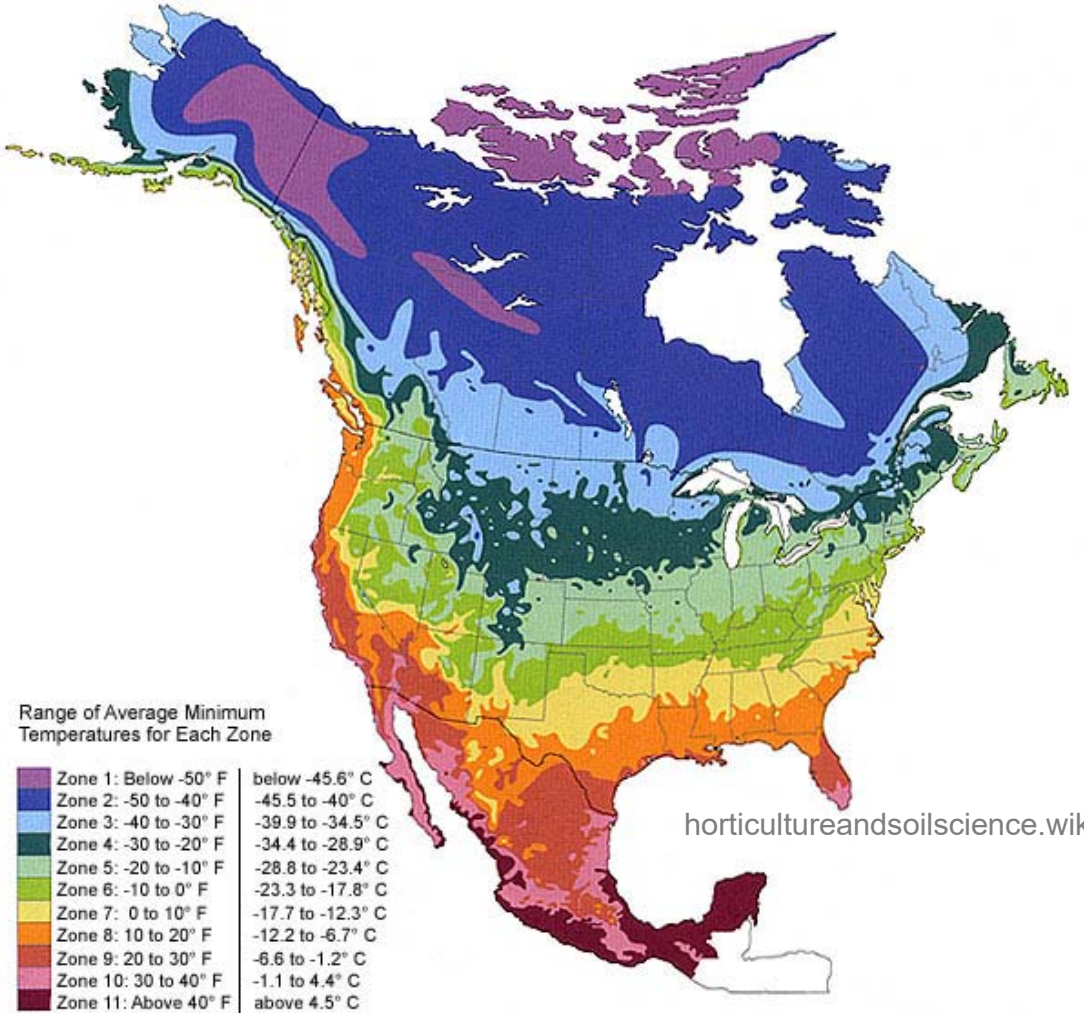
Transeius montdorensis

Life history parameters of phytoseiid mites

	N. cucumeris	*A. swirskii*	*A. limonicus*	*T.montdorensis*
Predation rate (1st instar thrips/day)	5.8[A] - 6.0[B]	4.0[A]	6.9[I]	7.3 - 14.5[C]
Oviposition rate (Eggs/day on pollen)	1.5[A] – 2.1	2 – 2.51[E,H]	1.5[I]	3.03[C]
Oviposition rate (Eggs/day on thrips)	2.0[A] - 2.2	0.09[D]-1.4[A]	3.2[I]	3.57[C]
Intrinsic rate of increase	0.154[F]- 0.184[G]	0.06 – 0.2[D,H]	0.16-0.25[J]	0.378[C]

[A] Buitenhuis et al 2008; [B] Van Houten; [C] Steiner et al 2004; [D] Wimmer et al 2008; [E] Amitai et al 1967; [F] Castagnoli and Simoni 1990; [G] Zhang et al 2005; [H] Lee and Gillespie 2011; [I] Van Houten et al 1995; [J] Audenaert et al., 2015

How would these mites perform in North America?



horticultureandsoilscience.wikia.com/wiki/Climate_Zone_Maps

Research Objectives

Evaluate how *T. montdorensis* predation rate and population growth compare:

- under various climatic and photoperiodic conditions.

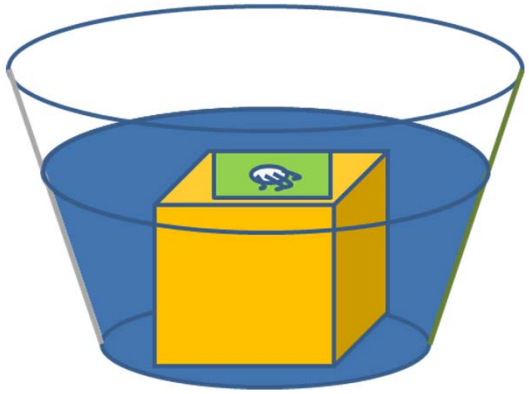
- to other phytoseiid mites commercially available in North America.

Experimental Approach

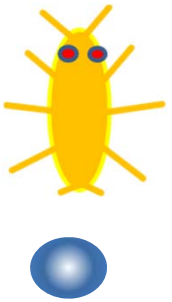
- **Laboratory trials** to assess impact of simulated summer or winter conditions on *T. montdorensis* predation and oviposition.

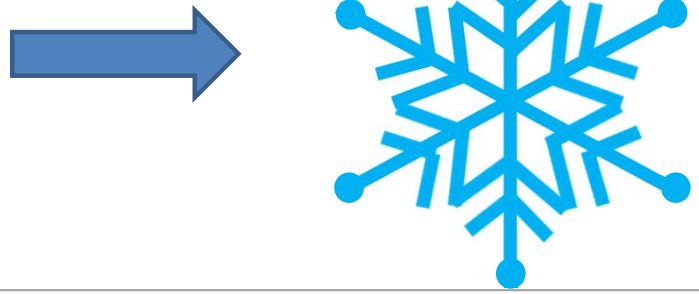
- **Greenhouse trials** to compare winter/spring efficacy of *T. montdorensis* to control western flower thrips on greenhouse pepper crops relative to other phytoseiid species commercially available in North America:
  - *Neoseiulus cucumeris*
  - *Amblydromalus limonicus*
  - *Amblyseius swirskii*

Laboratory trial design: Predation and oviposition tests

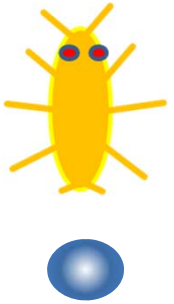


- 24° C
- 16 hour photoperiod



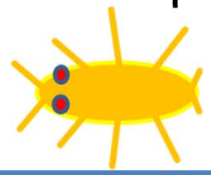


- 20° C
- 8 hour photoperiod



Laboratory trial results

Impact of season on predation and oviposition by *T. montdorensis*



Simulated season	Predation (L1 thrips/day)	Oviposition (eggs/day)
Summer (N = 56)	4.2 ± 0.3	0.3 ± 0.1
Winter (N = 64)	4.4 ± 0.3	0.1 ± 0.0
t-test	0.6	0.1

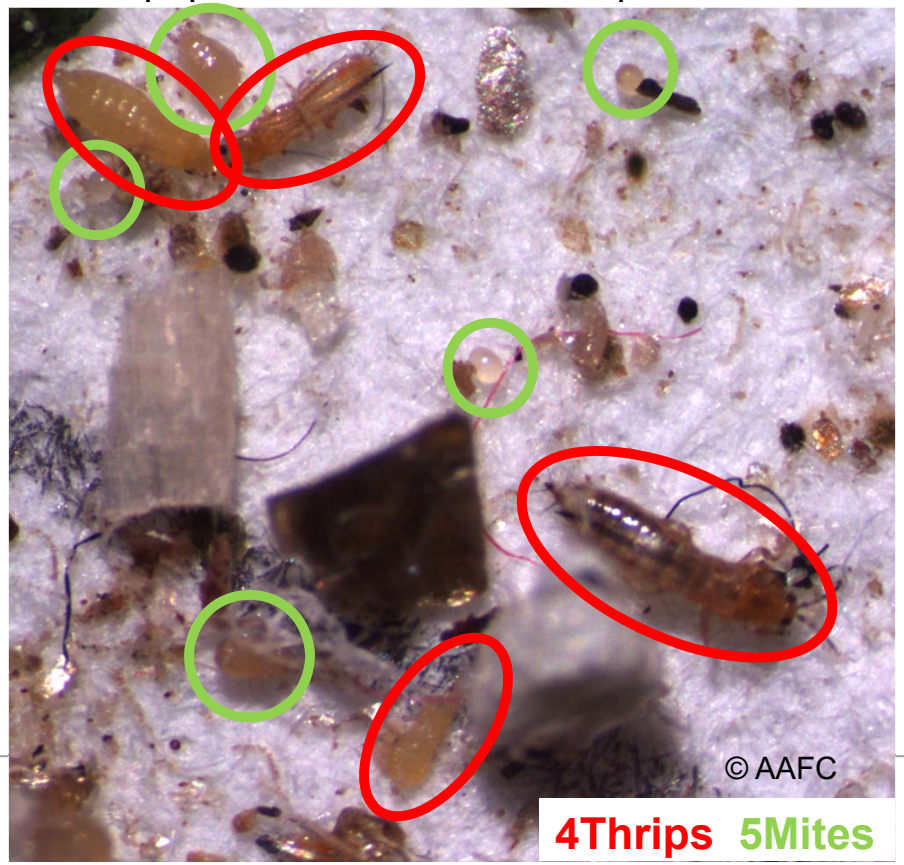
Season did not affect the number of western flower thrips consumed or eggs laid by *T. montdorensis.*

Greenhouse trial:
Comparative thrips suppression by predatory mites

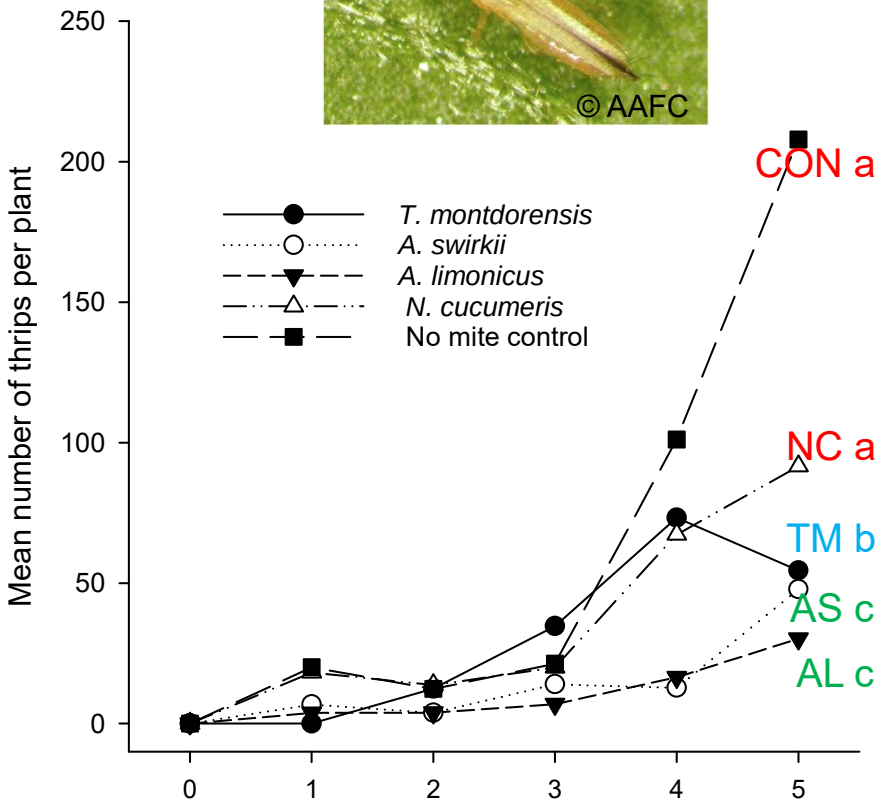
- Trials conducted in 2014 and 2016 (under CFIA PPC1 conditions PC-2006-006, P-2015-02295)
- Two greenhouses set at 22:17ºC (day:night), 70% RH, under natural lighting conditions.
- Three pepper transplants per cage.
- Thrips released at rate of 4 females/plant (+1 male/plant in 2014).
- Eleven days later, 50 mites/plant released (4 mite spp + 1 no mite ctrl).
- Treatments repeated 4X/ week for a total of 4-5 weeks.
- Thrips and mites numbers counted over time analyzed using an autoregressive (AR) covariance matrix.

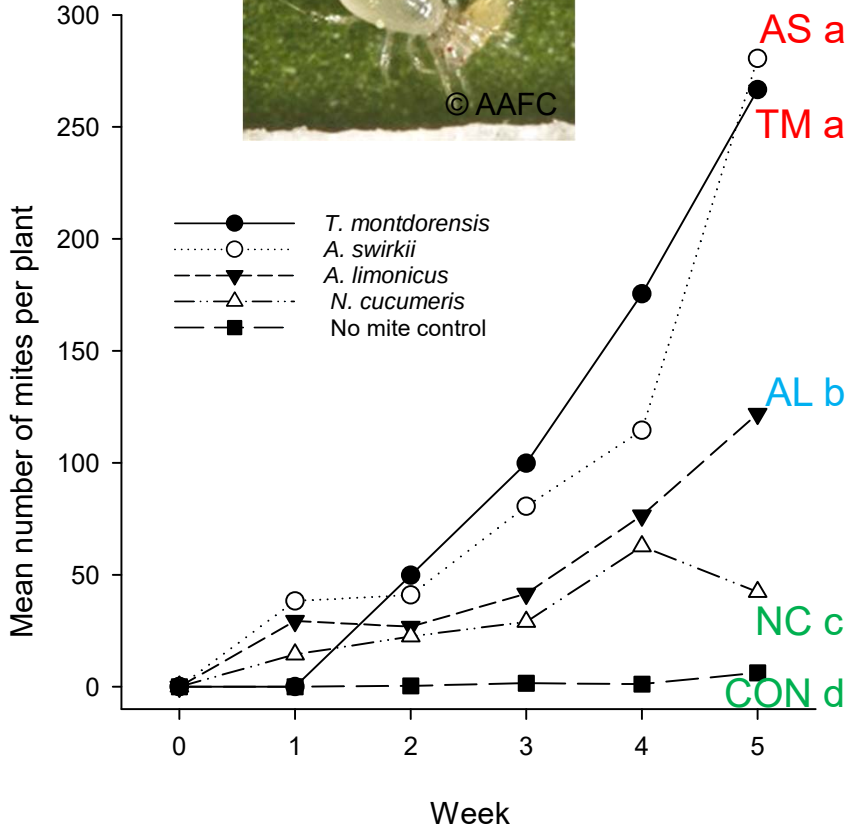
Greenhouse trial:
Comparative thrips suppression by predatory mites

Filter paper with leaf-washed thrips and mites

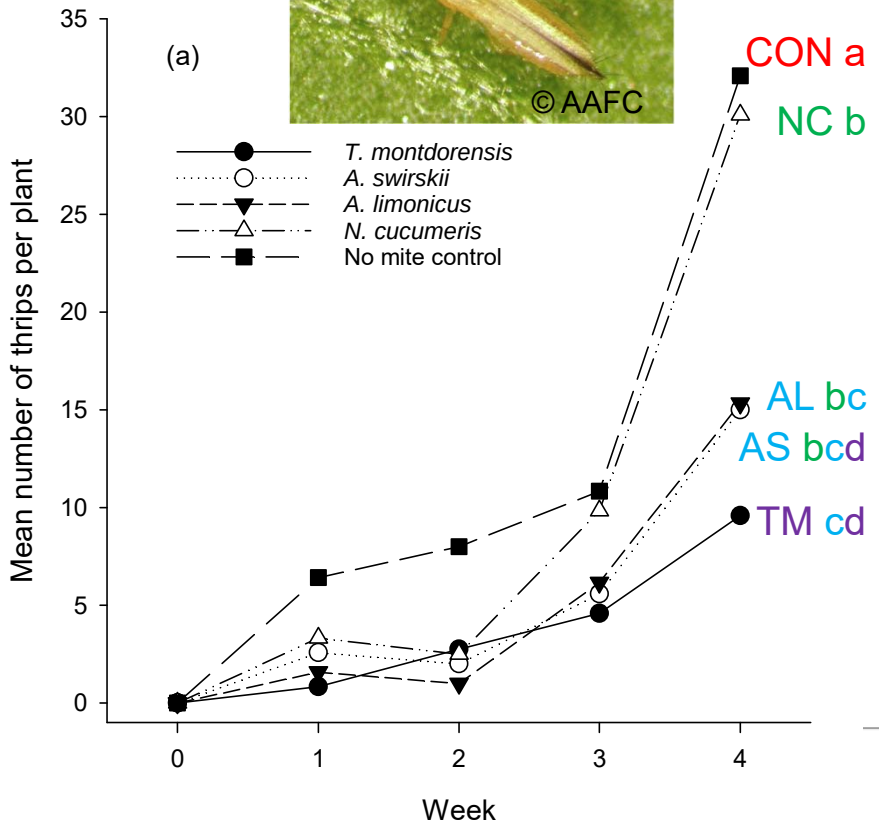


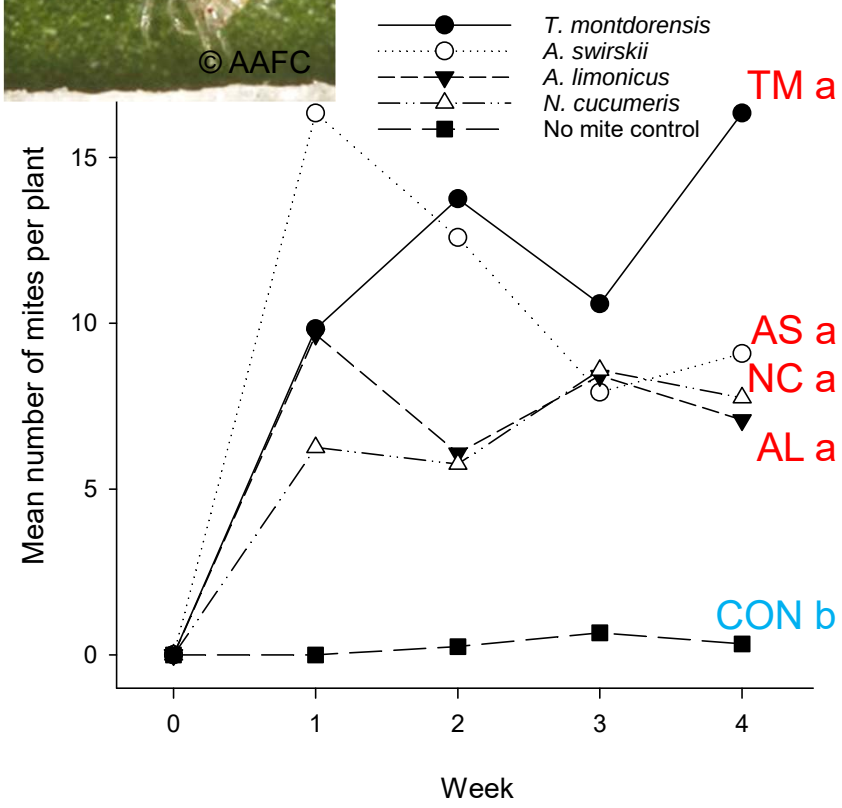
Results: 2014 greenhouse trials





Results: 2016 greenhouse trials





Results Summary

- In laboratory trials, season did not significantly affect ***T. montdorensis*** oviposition or thrips predation

- In greenhouse trials, **thrips** suppression by ***T. montdorensis*** was superior to that by ***N. cucumeris*** in both trial years, as well as to **A. limonicus** in 2014.
- ***T. montdorensis*** mite abundance was at least as great as that of ***A. swirskii, A. limonicus and N. cucumeris*** in both trial years.

Discussion

- Greenhouse trial year did affect overall thrips and mite population growth:
  - photoperiod
  - relative humidity
  - thrips colony genetics

- However *T.montdorensis generally* performed well in both laboratory and greenhouse trials, suppressing thrips and establishing as well or better than other mite species tested.

- **We predict that *T. montdorensis* population growth was on course to outpace those of other mites in both trial years.**

Discussion: How does *T. montdorensis* compare to other predatory mites?

- *T. montdorensis* is an active predator both at high as well as lower temperatures (does not diapause in winter).

- Is a Type III predator able to feed on other pests/foods when prey is scarce.

- Has a high rate of egg production relative to many mite species.

***T. montdorensis* could be a potentially valuable new tool for the biocontrol of thrips and other pests in North America.**

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