Assessing consumption efficiency of TSSM by predatory mites and the influence of biorational products on predators.

#LNC20-438

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INTRODUCTION

High tunnels (HTs) are a protected agriculture tool for specialty crop farmers. Cucumbers (*Cucumis sativa* L.) are well suited for HT production because their vertical growth pattern allows for space optimization and repeated flowering, offering multiple harvest opportunities **(Fig. 1A).** However, twospotted spider mite (*Tetranychus urticae* Koch; TSSM; **Fig. 1B**) is one of the primary pests of cucumbers in HT systems. TSSM often goes unnoticed by farmers until the damage is irreversible and the pest is difficult to control. Current recommendations are based on field or greenhouse production and rely on conventional miticides. However, more is needed to satisfy HT growers who wish to use organic pest management methods. Selecting the most efficacious and economical control methods for TSSM management in HT growing systems is difficult for growers because of the need for research-based evaluations in this unique growing environment.

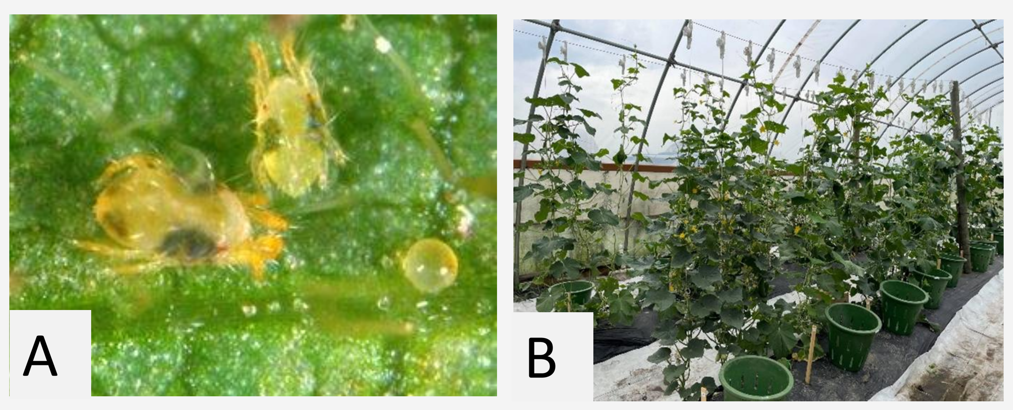

Figure 1. TSSM adult and egg, photo by John Obermeyer (A); cucumber plant vertically trellised inside a high tunnel (B).

OBJECTIVE

1. Evaluate TSSM egg consumption by predatory mites under high tunnel simulated temperature in incubators.
2. Assess the mortality effect of biorational products on predatory mites.

RESULTS

Predatory mite egg consumption bioassay
Predation rates differed among predatory mites under simulated HT temperatures (Poisson GLM, $\chi 2 = 7.36$, df = 4, p = 7.496e-05; **Fig 2**).

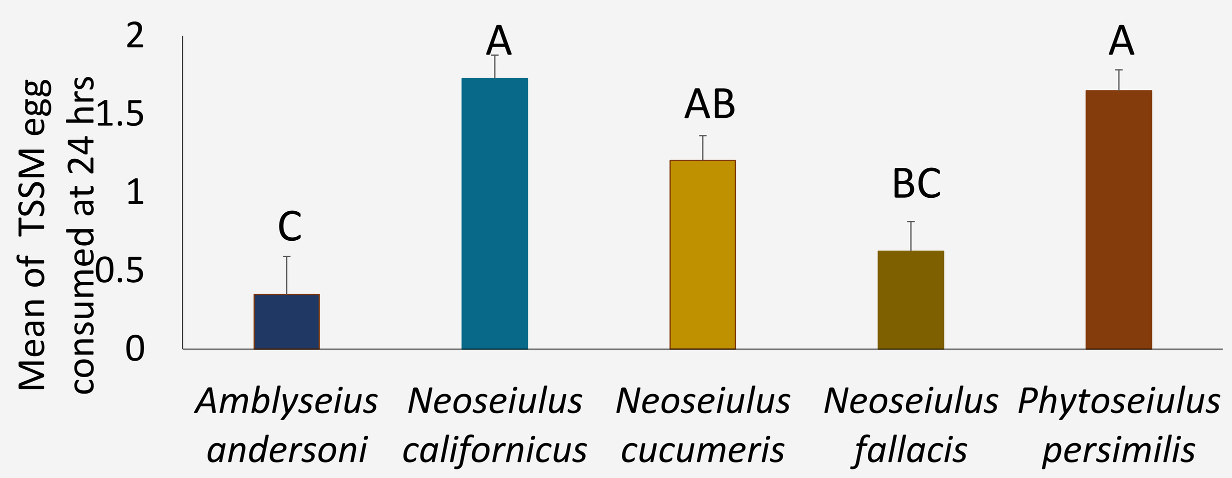

Figure 2. TSSM egg consumption after 24 hours of predatory mite exposure.

Predatory mite mortality bioassay using biorational pesticides
A. Andersoni sprayed with Pyganic and AzaGuard died at a faster rate compared to the water control treatment ($\chi 2 = 5.0$, df = 3, p = 0.026), and ($\chi 2 = 3.0$, df = 1, p = 0.084) respectively **(Fig. 3A)**. *Neoseiulus Fallacis* treated with AzaGuard exhibited a more rapid mortality rate when contrasted with the water ($\chi 2 = 9.7$, df = 1, p = 0.018). No significant spray effects were observed in other treatments and for *N. cucumeris* **(Fig. 3B)**.

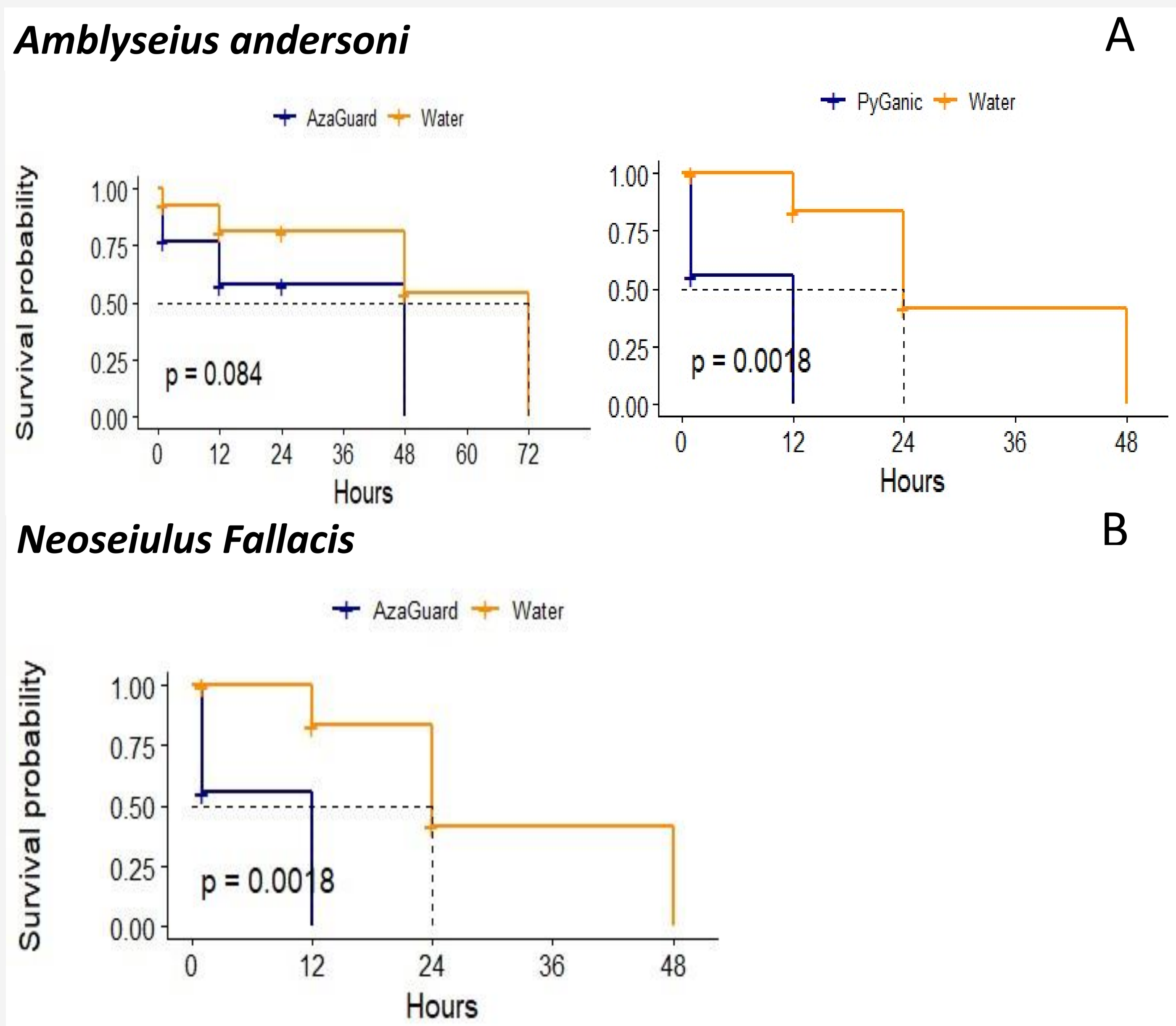

Figure 3. Survival comparison of *Amblyseius andersoni*, and *Neoseiulus Fallacis* when exposed to biorational pesticides.

METHODOLOGY

Predatory mite egg consumption bioassay
This experiment was conducted in a growth chamber simulating the temperatures experienced in HTs in Aug. (**Table 1**). Five predatory mite spp *(A. andersoni*, *N. californicus*, N. *cucumeris*, N. *fallacis*, and *P. persimilis)* were used to evaluate TSSM egg predation. Petri dishes containing a 6-cm cucumber leaf disk were loaded with 10 TSSM eggs, each predator evaluated in a separate dish, 10 replicates per predatory spp. in total.

Table 1. Temperature and relative humidity of the growth chamber oscillating through time (hours).

Description	T °C	RH %	Time range
step 1	15	60	9:00 pm – 8:00 am
step 2	25	50	8:00 am – 10:00 am
step 3	30	40	10:00 am – 12:00 pm
step 4	32	40	12:00 pm – 2:00 pm
step 5	39	40	2:00 pm – 3:00 pm
step 6	32	40	3:00 pm – 5:00 pm
step 7	30	50	5:00 pm – 7:00 pm
step 8	25	60	7:00 pm – 9:00 pm

Predatory mite mortality bioassay using biorationals
This experiments was conducted under the same chamber conditions (**Table 1**), and predatory mite spp. as the previous experiment. We used eight biorational products: Venerate CG®, AzaGuard®, Grandevo®, Cpt. Jack Neem Oil®, Azera®, Bioceres®, Pyganic®, and water. Mortality was evaluated at 1, 4, 24, 48, 72, and 96 hr after exposure to obtain survival curves **(Fig. 4)**.

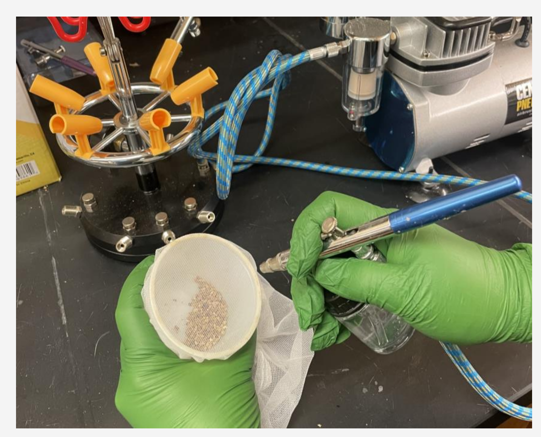

Figure 4. Application of biorational products to the predatory mite species. Each product was applied using an airbrush at the highest recommended label rate.

CONCLUSION

1. *N. californicus* and *N. cucumeris* consumed the most TSSM eggs under simulated HT temperatures
2. *A. andersoni* was the most susceptible to biorational pesticides.

REFERENCE

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