

# Evaluating the impacts of biorational pesticides on twospotted spider (*Tetranychus urticae*) and predatory mites in high tunnels



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## Introduction

High tunnels (HTs) are a protected culture 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 offers multiple harvest opportunities. However, twospotted spider mite (*Tetranychus urticae* Koch; TSSM; **Fig. 1A**) limit production in HT systems; they often go unnoticed by farmers until the damage is irreversible and difficult to control. Management recommendations are based on field or greenhouse experiences and rely on conventional miticides; options for organic growers are especially limited. Recommendations for organic products (**Fig. 1B**) and predatory mites (**Fig. 1C**) in HTs are needed.



Figure 1. TSSM adults and egg, photo by John Obermeyer (A); Example of one test product (Insecticidal soap, B); Adult predatory mite and TSSM eggs (C).

## Objective

Evaluate the mortality effect of biorational products on TSSM and predatory mites under HT-simulated temperatures

## Results

### TSSM adult mortality

Adults treated with all biorational products died at a faster rate compared to the water control (**Fig. 1**).

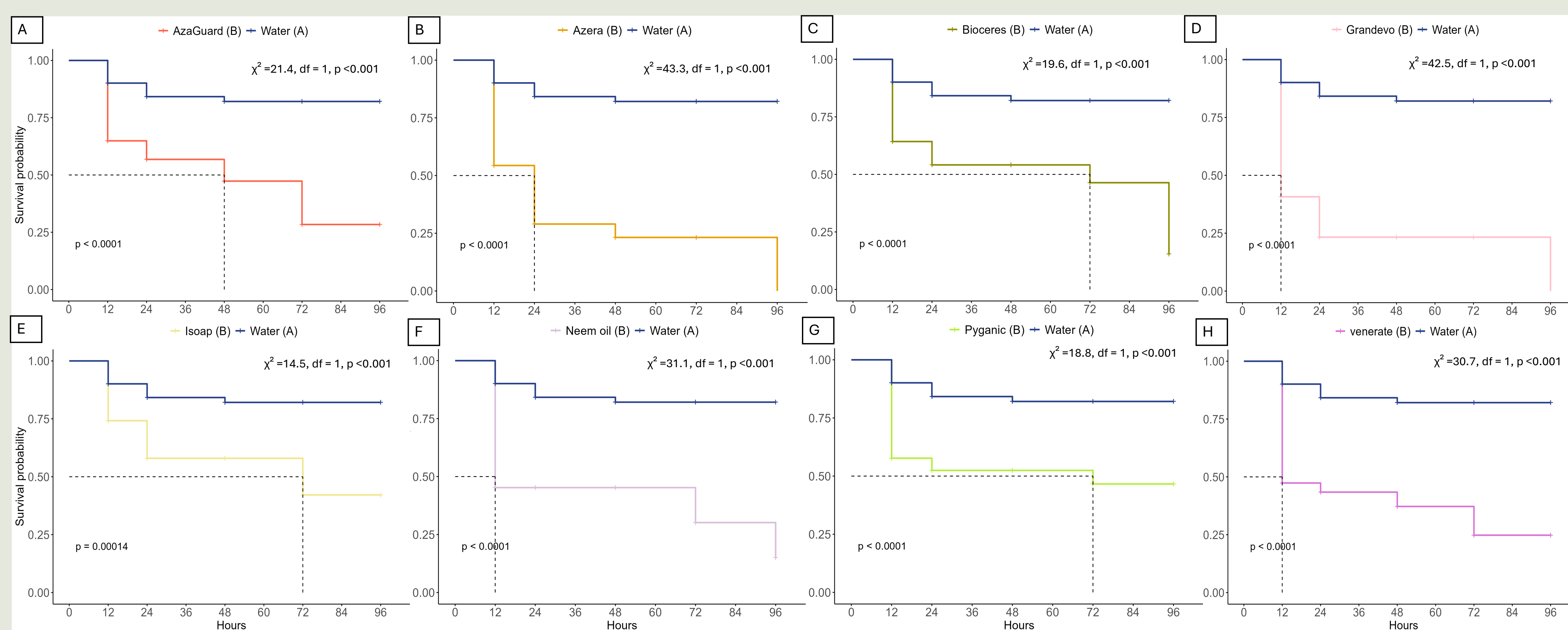


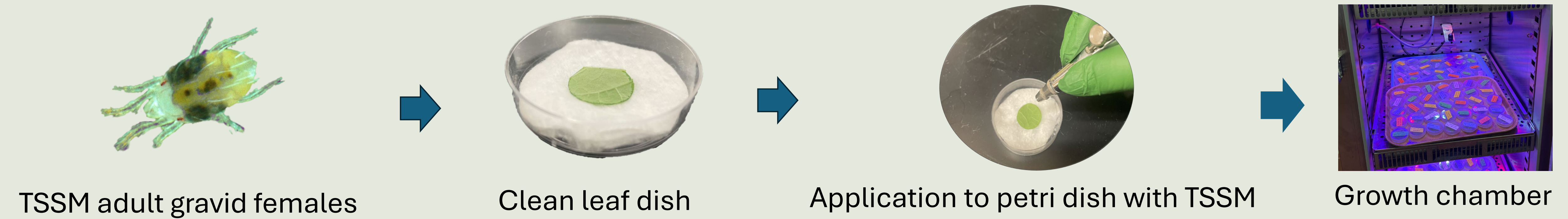
Figure 1. Survival probability of water (control) and AzaGuard on adult TSSM (A); Azera (B); Bioceres (C); Grandevo (D); Insecticidal soap (E); Neem oil (F); Pyganic (G); Venerate (H) over a 96-hours observation period.

## Conclusion

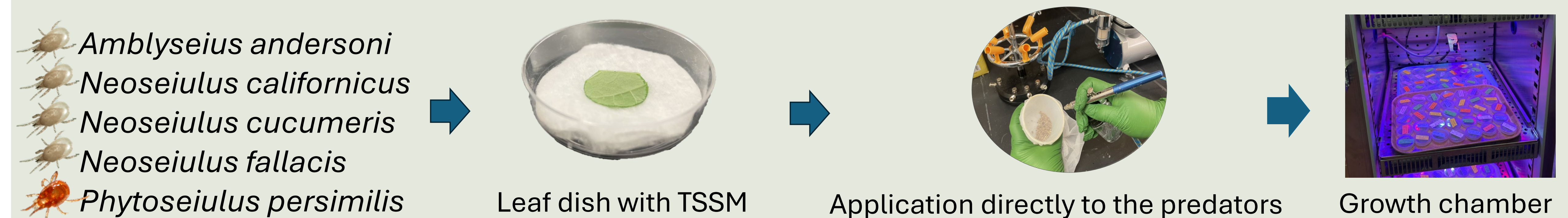
Combining compatible predatory mites and biorational pesticides can optimize TSSM management. *Phytoseiulus persimilis* performed best with all biorational products except Bioceres (*Beauveria bassiana*) and Grandevo (*Bacterium Chromobacterium*). Similarly, avoiding AzaGuard (Azadirachtin) for *Neoseiulus fallacis* and Azera (Azadirachtin - 1.2%, Pyrethrins - 1.4%) for *Amblyseius andersoni* can enhance compatibility and effectiveness.

## Methodology

### TSSM adult mortality



### Predator mortality and oviposition deterrence



**Table 1.** Biorational product, commercial names and active ingredients.

Commercial Name	Active ingredient
AzaGuard®	Azadirachtin
Azera®	Azadirachtin - 1.2%, Pyrethrins - 1.4%
Bioceres®	<i>Beauveria bassiana</i>
Cpt. Jack Neem Oil®	Clarified hydrophobic extract of neem oil, 70%
Grandevo®	<i>Bacterium Chromobacterium</i>
Cpt. Jack's Deadbug®	Potassium salt of fatty acids
Pyganic®	Pyrethrins
Venerate CG®	<i>Burkholderia</i> spp. strain A396
Water	Water

**Table 2.** Temperature and relative humidity of the growth chamber mimicking high tunnel conditions in August.

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

### Predator mortality

No biorational affected *N. californicus* or *N. cucumeris*. *Phytoseiulus persimilis* had higher mortality with Bioceres and Grandevo (**Fig. 2A, B**), *N. fallacis* with AzaGuard (**Fig. 2C**), and *A. andersoni* with Azera (**Fig. 2D**).

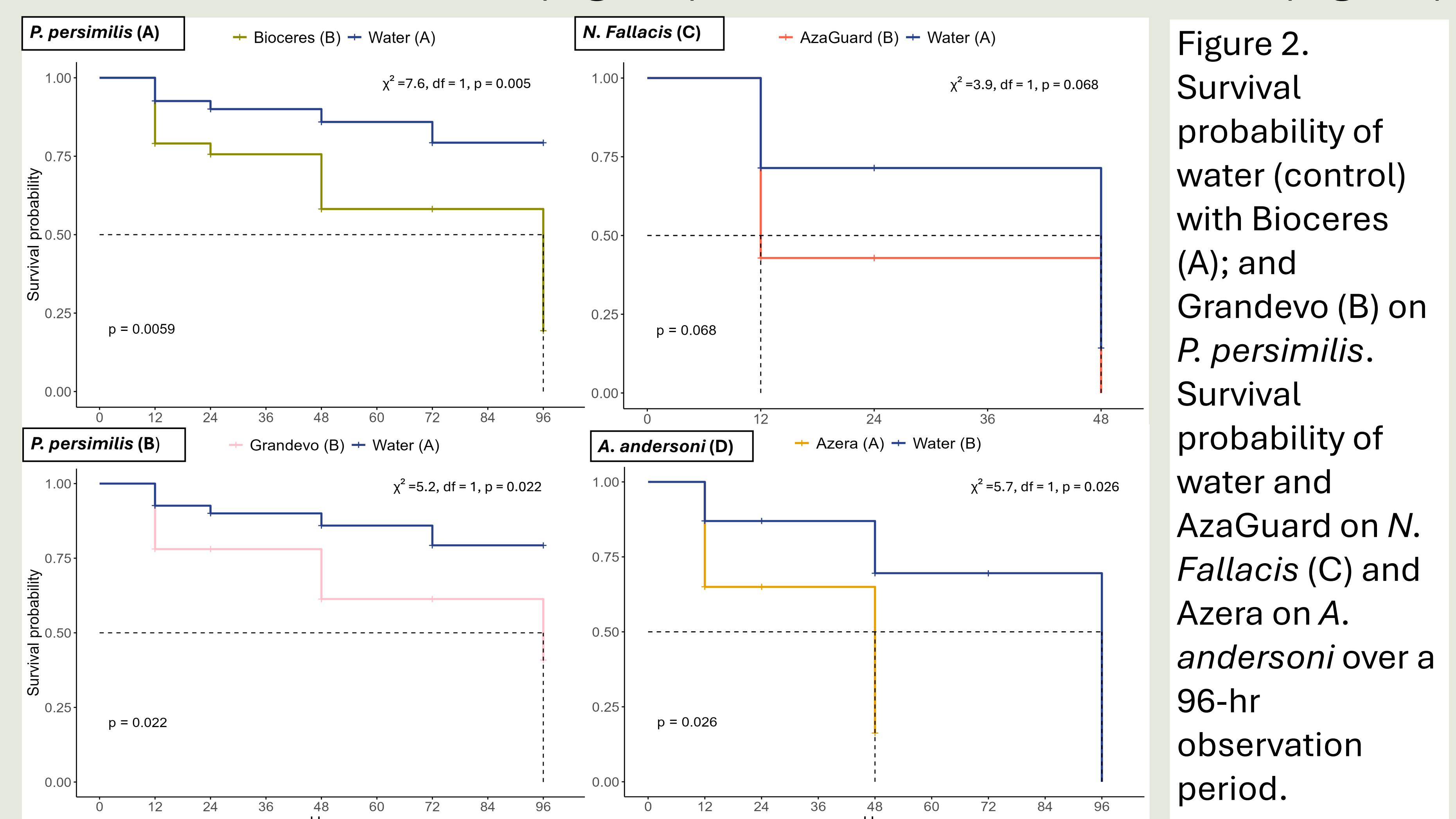


Figure 2. Survival probability of water (control) with Bioceres (A); and Grandevo (B) on *P. persimilis*. Survival probability of water and AzaGuard on *N. Fallacis* (C) and Azera on *A. andersoni* over a 96-hr observation period.