Thrips of the Trade: Quantifying the Effect of Herbivory-Induced Plant Volatile, (Z)-3-hexenyl propanoate, on *Thrips parvispinus* Host Plant Seeking Behaviours in Canadian Greenhouse Crops

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Introduction:

Thrips parvispinus **(Karny) (Thysanoptera: Thripidae) is a new and invasive pest of Canadian greenhouse crops.** The pest is not established in Canada but can be intercepted or detected on imported plant materials (1). Most direct damage is from pest feeding, while indirect damage is through the spread of plant diseases (2). Although herbivory-induced plant volatiles (HIPVs) have shown promise as repellents in related thrips species, **no published data exists on the behavioral response of *T. parvispinus* to (Z)-3-hexenyl propanoate ((Z)-3-HP)**, a common HIPV known to affect herbivore behavior.

Figure 1. *Thrips parvispinus* on mandevilla. Photo credit: Dr. S. Jandricic, OMAFA

Figure 2. *Thrips parvispinus* damage. Photo credit: Anna Mészáros, Commercial Vegetable Extension Agent, University of Florida / IFAS Extension Palm Beach County

Objectives:

The objective is to evaluate the impact of (Z)-3-HP on *T. parvispinus* in lab trials. The associated **hypothesis is that (Z)-3-HP has a significant deterrence effect on the thrips host plant selection behaviours.**

Methods:

- Thrips were released in the tube one at a time
- A three-minute time limit to choose between the treatment and control arm
- The treatment consisted of **six doses of a serial dilution of (Z)-3-HP in hexane**

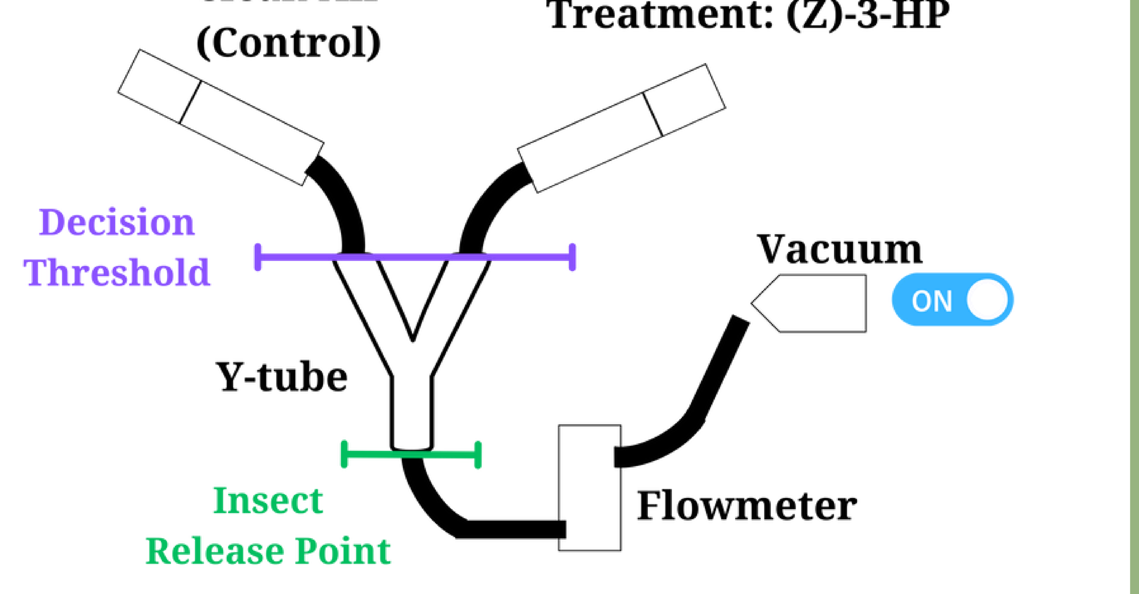

Figure 3. Visual representation of the y-tube apparatus.

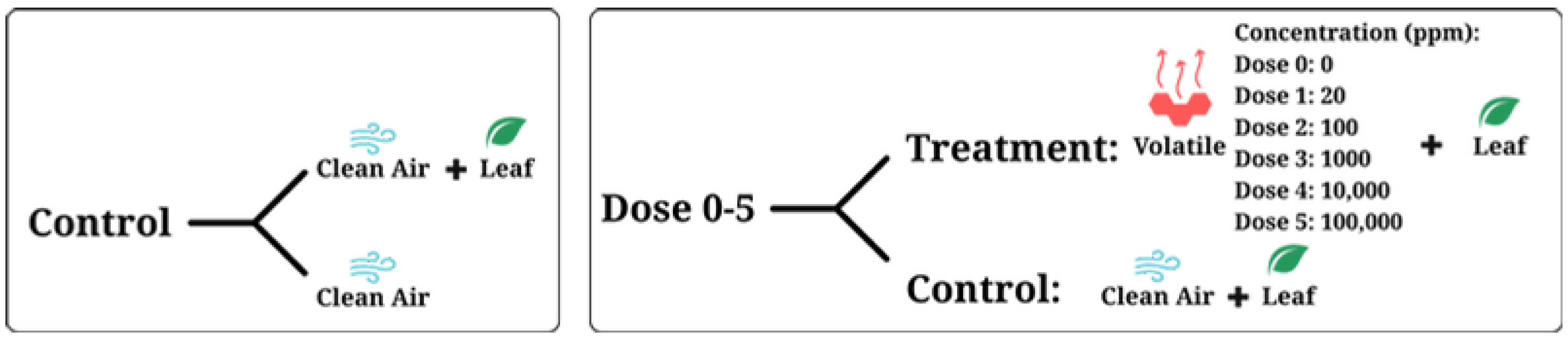

Figure 4. Visual representation of the control, treatment, and dosage.

Results:

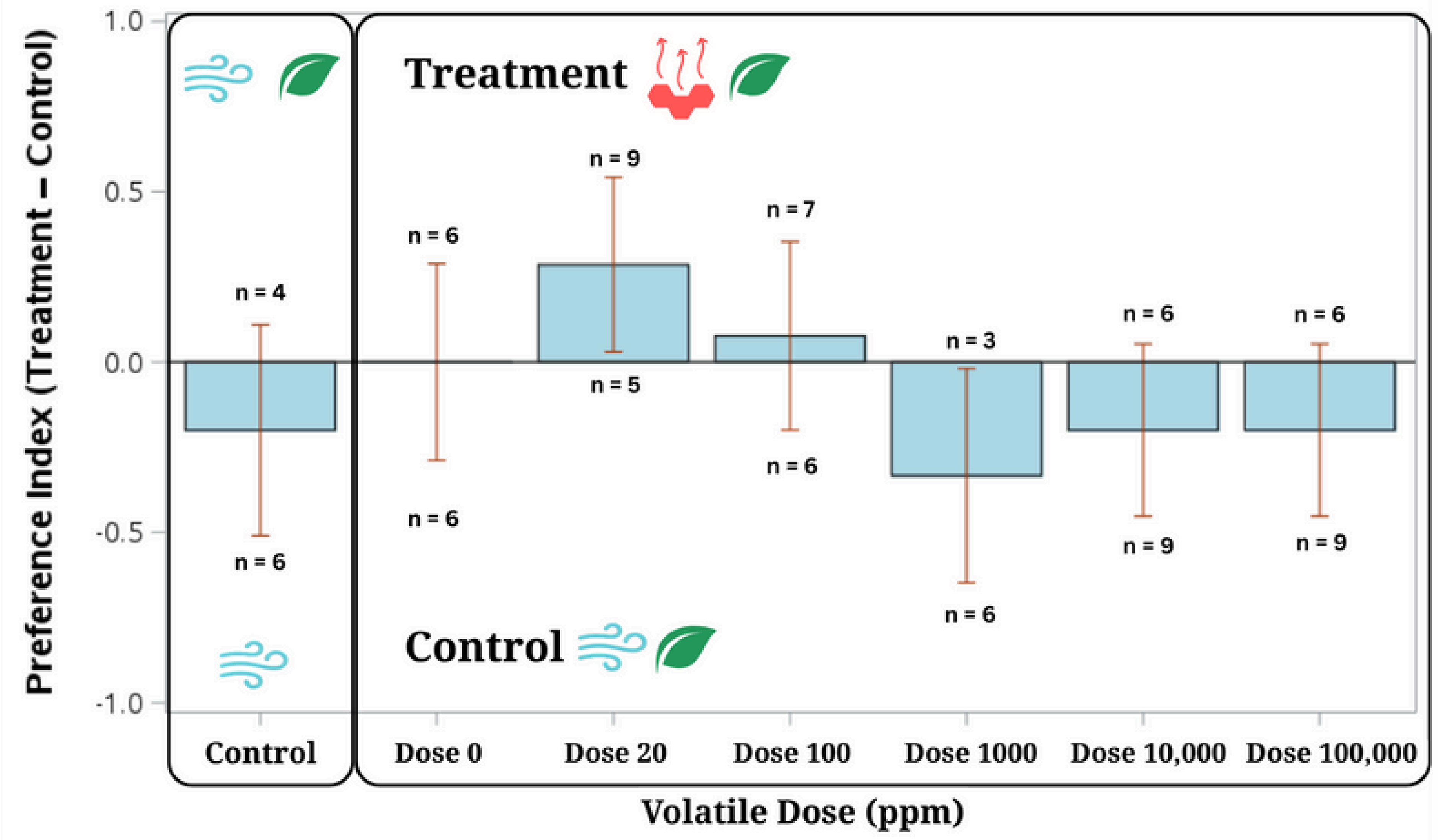

Figure 5. Preference index graph standardizing the responses so that positive one indicates complete preference towards the treatment, zero indicates no preference, and negative one indicates complete avoidance of the treatment. The error bars show standard error, and if the bar crosses zero, there is no significant preference or avoidance. The n values depict the number of responding individuals that chose either the treatment or control.

Dose (ppm):	Control	Dose 0	Dose 20	Dose 100	Dose 1000	Dose 10,000	Dose 100,000
Response Rate (total n = 20):	50%	60%	70%	65%	45%	75%	75%

Figure 6. Table showing how many of the twenty individuals tested at each dose crossed the decision threshold within the three-minute timeframe.

Conclusions:

- **None of the doses of (Z)-3-HP tested resulted in decisive repellency by *T. parvispinus*** (Wilcoxon signed-rank test, $p > 0.05$)
- Some doses lean numerically toward the treatment or control, but sample sizes are too small to detect significance due to the number of non-responding individuals
- This low response rate may also be behind the inconclusive results of the positive control
- The thrips walking response is very dose-dependent - which could account for the variable choices

Relevance & Future Directions:

Volatile cues like (Z)-3-HP could support **novel IPM tools** (repellents, push–pull systems, and lure-and-trap).
Results show no significant deterrence at tested doses but highlight the need for:

- Whole plant assays & greenhouse validation
- Optimizing delivery (e.g., slow-release dispensers)
- Integration and compatibility with biological control strategies

Supports the development of **sustainable, industry-ready pest management solutions**

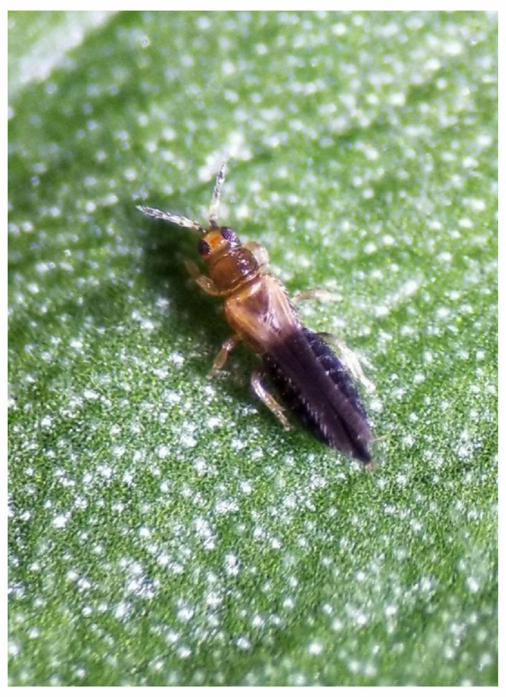

Figure 7. Adult female *Thrips parvispinus*. Photo credit: A. Summerfield, Vineland Research and Innovation Centre.

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References:

(1) Jandricic, S. E., Summerfield, A., Maw, H. E. L., Brunet, B. M. T., & Buitenhuis, R. (2024). Thrips Species Composition in Ontario Greenhouse Floriculture: Innovative Identification Tools and Implications for Integrated Pest Management. Insects, 15(3), Article 3. https://doi.org/10.3390/insects15030211

(2) Sanju, T., Sisodiya, D. B., & Gangwar, R. (2023). Invasive Thrips, Thrips parvispinus (Karny) an Invasive Threat: A Review. 40, 2170–2175.

(3) Kirk W., Jan de Kogel W., Koschier E., & Teulon D. (2021) Semiochemicals for Thrips and Their Use in Pest Management. Annual Review of Entomology, 66, 101-119. https://doi.org/10.1146/annurev-ento-022020-081531