Developing a Systems Approach to Pest Management on Greenhouse Vegetable Crops: Mirid Predator Selection

LEAD RESEARCHER

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To find new integrated pest-management strategies to protect greenhouse vegetable crops, a research team is studying two native North American mirid species: *Dicyphus discrepans* and *Dicyphus famelicus,* and one adventive species, *Nesidiocoris tenuis.*

Over the past winter, the research team started mirid olfactometry assays (smell trials) using a Y-tube olfactometer to test predator responses to western flower thrips and greenhouse whitefly. This test was meant to better understand how mirid species use scent cues to find prey in greenhouse environments. Intraguild predation data from petri dish arena trials and full-plant greenhouse trials was analyzed. Greenhouse movement data was inspected comparing dispersal patterns to pest hotspots. Natural adult emergence trials were started to help explain inter-species predation outcomes. A tomato–sesame drench experiment focusing on egg laying preference was conducted, as well as laboratory tests examining the trade-off between fertility and longevity.

Through greenhouse intraguild predation trials, researchers discovered that N. tenuis is suppressed in tomato–mullein systems when combined with D. famelicus. Movement trials showed N. tenuis had the highest dispersal, followed by *D. famelicus,* while *D. hesperus* rarely moved away from banker plants. Olfactometry assays found *D. hesperus* and *N. tenuis* prefer whitefly-infested plants over clean plants but don't have a preference for thrips-infested plants or when both pests are present. Egg laying studies revealed all species prefer to lay eggs on sesame, except *D. hesperus,* which uses sesame and mullein equally. Drenching sesame alone was found to reduce *N. tenuis* populations than compared to untreated controls.

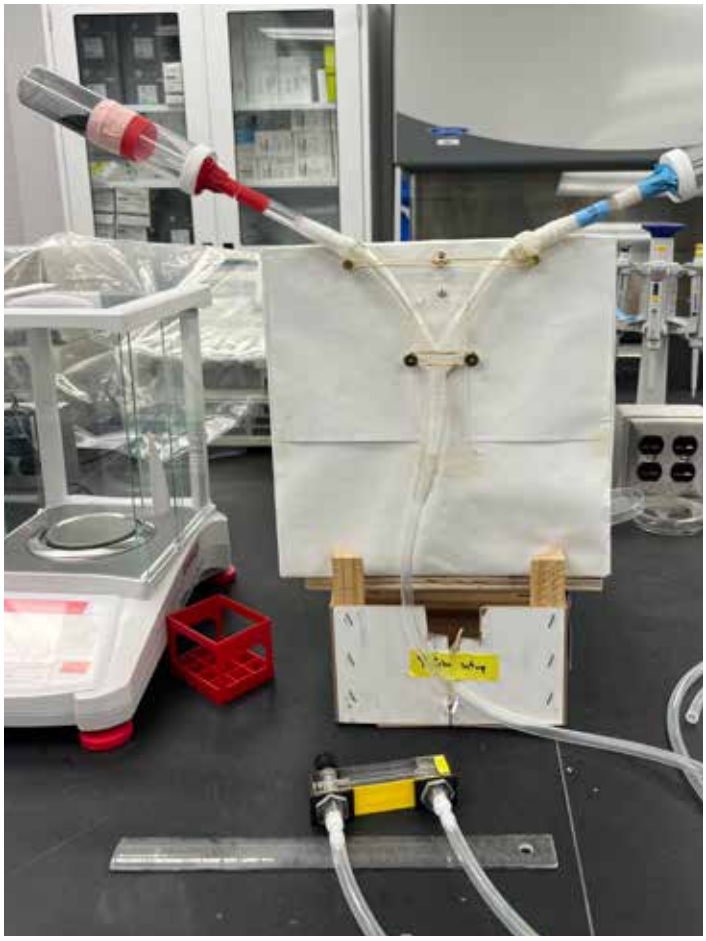
A greenhouse trial of mirid host preferences. Photo: Isabella Nardone

These findings directly impact greenhouse pest management. By understanding inter-species predation dynamics, growers can avoid combinations of biological control agents that may interfere with each other. Movement data is showing growers where to monitor for pests and beneficial insects. The smell test results highlight that mirids are more effective against whitefly than thrips. The strong egg laying preference for sesame and the effects of sesame drenching suggests this plant could be used as a trap crop or oviposition sink to help manage N. tenuis populations.

Throughout the rest of the growing season, the research team will complete the smell test trials with *D. famelicus*, finalize natural mortality trials and analyze all collected data. Microbial control trials targeting *N. tenuis* will happen with light-based experiments started in controlled cabinets as a precursor to larger-scale greenhouse studies. During winter, the researchers plan to finish the remaining smell experiments. They will also work on microbial and lighting studies. Before the research activity is done, the research team wants to develop a theoretical biological-control model comparing organisms with a fast life-history strategy to those with a slow life history.

KEY TAKEAWAYS:

- Through greenhouse intraguild predation trials it has been discovered that *N. tenuis* is suppressed in tomato–mullein systems when combined with *D. famelicus.*
- Movement trials showed *N. tenuis* had the highest dispersal, followed by *D. famelicus*, while *D. hesperus* rarely moved away from banker plants.
- Olfactometry assays (smell trials) found *D. hesperus* and *N. tenuis* prefer whitefly-infested plants over clean plants but don't have a preference for thrips-infested plants or when both pests are present.
- Egg laying studies revealed all species prefer to lay eggs on sesame, except *D. hesperus,* which uses sesame and mullein equally.
- Drenching sesame alone was found to reduce *N. tenuis* populations than compared to untreated controls.



A mirid prey attraction assay. Photo: Isabella Nardone