

# Canadian Agri-Science Cluster for Horticulture 3



## Update to Industry

### Semi-Annual – Fall 2021

**Activity title:** Evaluating biological control strategies for the tomato leaf mining moth (*Tuta absoluta*), a potential invasive greenhouse pest in Canada

**Name of Lead Researcher:** Dr. Roselyne Labbe and Dr. Lauren Des Marteaux, AAFC

**Names of Collaborators and Institutions:**

**Cara McCreary**, Greenhouse integrated pest management specialist, Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA)

**Dr. Sherah VanLaerhoven**, University of Windsor, co-director of MSc student working on this project.

**Nature Conservancy of Canada**

**Thames Talbot Land Trust**

**Parks Canada**

**Activity Objectives (as per approved workplan):**

1. Field survey for native natural enemies of the tomato leaf miner, *Tuta absoluta* (predators and parasitoids).
2. Establish rearing methods for predators and parasitoids.
3. Define the life history, predatory capacity and biological control potential of new agents on greenhouse crops.
4. Identify and apply novel molecular tools for identification and monitoring of the tomato leaf miner.

**Research Progress to Date (use plain language, not to exceed 500 words):**

Despite COVID-related restrictions for onsite work and associated project delays, we have made substantial progress on the project as a whole. Placing greater emphasis on our field surveys was critical to our discovery of key predatory hemipteran species in Ontario, and we have successfully established colonies and progressed on mass rearing methods for two predatory nabids as well as three predatory mirids. In addition to prior life history and predatory capacity trials now complete for the nabids against two moth species serving as proxies for *T. absoluta*, similar work is now underway for the mirids. Among these five candidate hemipteran biocontrol agents, we are confident that at least some will be effective against *T. absoluta*. Our fourth milestone was modified to focus on DNA barcoding and databasing of the hemipterans collected in this study.

**Specific objectives / milestones**

**1 - Field survey for native natural enemies of *T. absoluta***

During previous reporting periods, we completed predatory hemipteran surveys in southern and northern Ontario (Sudbury and the Kawarthas), collecting ~1,300 specimens in total. Key predators were morphologically identified by the authority taxonomist at the Canadian National Collection.

## 2 - Establish rearing methods for predators

In the previous reporting period, we have successfully established colonies and rearing methods for two predacious nabid species: *Nabis americoferus* and *Hoplistocelis pallescens*, as well as three predacious mirid species: *Dicyphus discrepans*, *D. famelicus*, and *M. tenuicornis*.

## 3 - Define the life history, predatory capacity and biological control potential of new agents on greenhouse crops

We have previously completed trials for defining the developmental time and survival to adulthood for both nabids, and have now completed longevity and fecundity trials for *N. americoferus*. We have also previously completed predatory capacity trials of *N. americoferus* on eggs of the moth *Ephestia kuehniella* and are progressing with similar trials on eggs and first larval instars of *Trichoplusia ni* moths. We are now also working to complete life history characterization and predatory capacity trials for the three predatory mirids. We completed an additional study on the ability of *D. discrepans* and *D. famelicus* to establish populations on field tomato.

## 4 - Identify and apply novel molecular tools for identification and monitoring *T. absoluta*.

Due to the [publication](#) of a real-time PCR assay for the identification of *T. absoluta*, we have modified this objective to focus on DNA barcoding and databasing of native predatory hemipterans. We have completed optimization of hemipteran barcoding primer sets, and expect to complete the sequencing of surveyed hemipterans by early 2022.

## Extension Activities (presentations to growers, articles, poster presentations, etc.):

### Conference posters

1. Desloges Baril, P., Des Marteaux, L., Labbé, R. Mlynarek, J., and VanLaerhoven, S. 2021. Evaluation of native Hemiptera for biocontrol in Canadian tomato crops. Ontario Fruit and Vegetable Convention.
2. Laflair, A., VanLaerhoven, S., Des Marteaux, L., Mlynarek, J. and Labbe, R. 2021. Egg feeding potential of *Nabis americoferus*: a native biological control agent of greenhouse pests. Ontario Fruit and Vegetable Convention.
3. Laflair, A., VanLaerhoven, S. and Labbe, R. 2020. Assessing the predatory capacity of *Nabis americoferus*: a native biological control agent of greenhouse pests. Canadian Greenhouse Conference.
4. Desloges Baril, P., Des Marteaux, L., and VanLaerhoven, S. 2021. Evaluation of native Hemiptera for biocontrol in Canadian tomato crops. Canadian Greenhouse Conference.
5. Desloges Baril, P., Des Marteaux, L., and VanLaerhoven, S. 2021. Exploring native predatory hemipteran species. Ontario Pest Management Conference.
6. Desloges Baril, P., Des Marteaux, L., and VanLaerhoven, S. 2021. Exploring native predatory hemipteran species. Joint Annual Meeting of the Entomological Society of Canada and Entomological Society of Ontario.
7. Laflair, A., VanLaerhoven, S., Des Marteaux, and Labbé, R. 2021. Egg feeding potential of *Nabis americoferus*: a native biological control agent of greenhouse pests. Canadian Greenhouse Conference. (Virtual Poster)
8. Laflair, A., VanLaerhoven, S., Des Marteaux, and Labbé, R. 2021. Reproductive and life-history potential of *Nabis americoferus*: a native generalist biological control agent. Entomology 2021 Annual meeting of the Entomological Society of America. (Virtual Poster)
9. Laflair, A., VanLaerhoven, S., Des Marteaux, and Labbé, R. 2021. Functional response and predatory capacity of a native generalist biological control agent, *Nabis americoferus* Carayon (Hemiptera: Nabidae), towards lepidopteran pests. Ontario Pest Management Conference (Virtual Poster)

### Conference oral presentations

10. Desloges Baril, P., Des Marteaux, L., and VanLaerhoven, S. 2021. Exploring native predatory hemipteran species. Annual Meeting of the Entomological Society of America.

## COVID-19 Related Challenges:

This year continued to see COVID-related challenges in the form of reduced access to HRDC laboratory and greenhouse facilities; up until November 22, 2021, restrictions on the number of staff working in any given lab space were in place. Until now this has meant that onsite work activities were scaled back to accommodate COVID-related safety protocols. Going forward, we foresee that the lifting of these restrictions will allow us to move more rapidly on completing the milestones associated with this project.

**Specific impacts on work objectives:**

**Objectives 3:** In 2021 our work on these objectives remained limited due to personnel capacity limits in place at HRDC. Despite this limitation, we have made substantial progress on life history and predatory capacity trials and this work continues to accelerate as restrictions ease at HRDC.

**Objective 4:** Due to both COVID-related restrictions as well as the recent publication of a real-time PCR assay for the identification of *T. absoluta*, we have refocused this objective to DNA barcoding and databasing of native predatory hemipterans. These activities are now underway, albeit slowly. As with objective 3, we expect this work to accelerate as work restrictions are eased.

**Key Message(s):**

We conducted extensive surveys of predatory hemipterans across Ontario, which yielded a number of new candidate biocontrol species. We successfully established colonies of these species, and have partially characterized life history traits and predatory capacities against moth prey and other pests. We expect that these predators will have a significant commercial value for greenhouse and field crop protection in Canada.

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