

Canadian Agri-Science Cluster for Horticulture 3



Update to Industry

2020-21 – Semi-Annual

Activity title:

Activity 6 - Evaluating biological control strategies for the tomato leafmining 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:

1. Survey for natural enemies of *Tuta absoluta*.

In this project year, field surveys for hemipteran predators has taken an important precedent over laboratory and greenhouse activities. For instance, two MSc students working on this project, Andrew LaFlair and Paige Desloges Baril, in addition to the project lead, Roselyne Labbe, have surveyed for predatory Hemiptera from multiple natural sites across Ontario. Locations surveyed include South Western Ontario (Essex County), Eastern Ontario (Kawartha Lakes Region), and Northern Ontario (Nipissing and Sudbury Regions). To sample specimens in Essex County and the Sudbury region, three evenly spaced sweep lines and six beat sites were selected. Over 700 specimens were collected from the Sudbury region, and about 600 specimens from the Essex County region. These specimens are currently being identified to the species level. We are now completing a thorough and systematic quantification of the diversity and abundance of these predators, which will populate a database of biological control species that will be useful for future study on the basis of season and location. This work, which began in May 2020, has notably provided a source of some important native predatory hemiptera including *Dicyphus famelicus* and *Macrolophus separatus*, whose biological control potential will be examined once we successfully establish colonies for these species. In addition, this survey can provide a better understanding of how members of hemipteran families Miridae (*Dicyphus* and *Macrolophus* species) and Nabidae (*Nabis* and *Hoplistocelis* species) are impacted by various environmental factors.

2. Rearing natural enemies

As indicated above, our current work for this project year now focuses on the establishment of colonies for the predatory hemipterans *Dicyphus famelicus* and *Macrolophus separatus*. These are in addition to our established colonies of *Nabis americanoferus* and *Hoplistocellis pallescens*, which continue to be reared at the HRDC. Towards this objective, we have been successful in rearing new mirid species on solanaceous host plants, a method which will facilitate the mass production of predators for further biological control studies.

3. Characterizing natural enemies

While some of the milestones associated with this activity have been achieved to date, we have not been able to progress with laboratory or greenhouse trials since March 2020 due to factors beyond our control. As this work largely depends on MSc student access to the HRDC facilities to characterize the life history and biocontrol potential for hemipteran predators, their progress on these objectives have only now, in November 2020, been reinitiated. These students have now regained access to AAFC facilities, and will be able to resume functional response experiments with *Nabis americanoferus*, as well as life history experiments with *Dicyphus famelicus* and *Macrolophus separatus*. To date, student Andrew LaFlair has completed life history experiments with *N. americanoferus* and characterized the functional response of this predator to prey eggs of the Mediterranean flour moth, *Ephestia kuehniella*, which serves as our current proxy for the invasive pest, *Tuta absoluta*.

4. Molecular identification of *T. absoluta*

This activity has not yet begun but should be initiated starting in January 2021.

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

1. Laflair, A., Van Laerhoven, S. and Labbe, R. 2020. Assessing the predatory capacity of *Nabis americanoferus*. Canadian Greenhouse Conference (Poster October 2020).
2. Mlynarek, J., LaFlair, A., Zhang, K., Vilcu, P., Sim, K., Rizzato, R., Gagnier, D. and Labbe, R. 2020. Predatory capacity and life histories of two native North American nabids, Ontario Fruit and Vegetable Growers Association AGM, Niagara Falls, ON.
3. Labbé, R. Update on the evaluation of biological control strategies for the tomato leafmining moth (*Tuta absoluta*). Report to the Thames Talbot Land Trust on June 4, 2020.

COVID-19 Related Challenges:

We anticipate that work associated with characterizing natural enemies, both in the laboratory as well as in the greenhouse (**objective 3 - milestone 3**), will be largely delayed until the next calendar year. We also expect a delay in completing the molecular identification of *Tuta absoluta* (**objective 4 - milestone 4**) until at least 2021.

Key Message(s):

This year to date, has presented clear challenges towards our adhering to anticipated timelines for research objectives which required our access to HRDC laboratory and greenhouse facilities. Due to stringent workplace restrictions associated with COVID-19 prevention protocols in place, many of our staff and students were not permitted to enter these facilities to complete work associated with objectives 3 and 4.

Despite this, we have been incredibly fortunate in our ability to identify and establish colonies for some very important predatory hemipteran species, namely *Dicyphus famelicus* and *Macrolophus separatus* and hope to find a way to explore their predatory potential in the remaining portion of this research project. In light of the brevity of this remaining time, we would also be grateful to explore ways to extend or defer funds from 2021-2022 to 2022-2023 so that we may more completely characterize these excellent predator candidates both in greenhouse and field environments.

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