

# Canadian Agri-Science Cluster for Horticulture 3



## Update to Industry

### 2020-21 – Semi-Annual

**Activity title:**

Activity 5 - Integrated management of the pepper weevil, an invasive pest of greenhouse pepper crops in Canada

**Name of Lead Researcher:** Roselyne Labbe, PhD

**Names of Collaborators and Institutions:**

- Félix Longpré, Insect rearing biologist, London Research and Development Centre, Agriculture and Agri-Food Canada
- Cara McCreary, Greenhouse Vegetable Integrated Pest Management Specialist, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
- Miyuki Santiago, Business Development, Koppert Biological Systems
- Niki Bennett, Science Coordinator, Ontario Greenhouse Vegetable Growers
- Dr. Cynthia Scott-Dupree, Bayer Chair in Sustainable Pest Management School of Environmental Sciences University of Guelph.
- Bruce Power and Nordion, producers of Cobalt-60 isotopes required for weevil irradiation.

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

- 1) Develop improved rearing methods for the pepper weevil.
- 2) Evaluate reduced-risk conventional and biopesticides for the management of the pepper weevil.
- 3) Evaluate non-target impacts of management products on beneficial insects used in greenhouse pepper biological control.
- 4) Establish the efficacy of parasitoid *Jaliscoa hunteri* for the management of the pepper weevil. Establish and compare the efficacy of rearing methods for *J. hunteri* production. Explore alternate crop delivery methods for *J. hunteri*.
- 5) Conduct laboratory and greenhouse trials investigating the potential of the Sterile Insect Technique (SIT) for managing the pepper weevil.

**Research Progress to Date:**

**1. Improve pepper weevil rearing methods**

During the fall of 2020, Félix Longpré conducted trials, which examined the potential for a low intervention pepper weevil rearing system involving a continuous supply of ornamental pepper plants used in rotation in the rearing cages. This method seems promising and will be further improved as we are currently working on optimizing plant yield. Trials have also been conducted to examine the potential of CO<sub>2</sub> and other gases to accelerate the collection pepper weevils from the plants. As we gradually return to working on site in Fall 2020, we anticipate advancing our investigation of the role of artificial diets for pepper weevil rearing (conducted at the London RDC by Felix Longpre).

## 2. Evaluate pepper weevil control agents

Over the past project year, we have completed and published work associated with assessing a total of 16 different insecticidal, biological and reduced risk products for the control of the pepper weevil in greenhouses (citation below). Results from these trials are now directly contributing to new label expansions and registrations in Canada for pepper weevil control products. These include potential label expansions and registrations for kaolin clay, *Beauveria bassiana* strain ANT-03, mineral oil and Spinetoram.

## 3. Non-target testing

Laboratory trials assessing the non-target effects of the above identified insecticidal agents on biological control organisms was originally planned to occur in spring 2020. However this research activity has been delayed due to our reduced on-site workforce. When the opportunity arises, we hope to proceed with this research activity. Alternatively, we are interested in discussing with the CHC and AAFC, the possibility of altering this objective, to focus instead on evaluation of the overwintering potential or cold tolerance of pepper weevil in Canada.

## 4. Parasitism of the pepper weevil

As of fall 2020, research on the parasitic wasp, *Jaliscoa hunteri* led by MSc student Serena Leo, has been re-initiated. We are now seeking to elucidate how factors such as host life stage, host feeding, release density and release frequency influence the wasps' biocontrol potential of pepper weevil.

## 5. Evaluate Sterile Insect Technique (SIT) for pepper weevil management

Work associated with this objective has also been initiated in fall 2020 as incoming MSc student, Jacob Basso (co-supervised by Dr. Cynthia Scott-Dupree at the University of Guelph has now begun this research at the HRDC. Jacob is currently using artificial oviposition substrates and diets to facilitate his SIT studies as they will allow him to readily extract pupae for irradiation. Jacob is also preparing to begin experiments that will assess pepper weevil reproductive potential following weevil irradiation. Towards this goal, a container for irradiating pepper weevil pupae is currently being designed in collaboration with Nordion. Once complete, we will subsequently initiate studies on the minimum dosage required to sterilize pepper weevil, one at which would retain irradiated weevil flight and mating abilities, which are both critical to the success of a SIT strategy.

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

1. Labbé, R., Gagnier, D., Rizzato, R., Tracey, A. and McCreary C. 2020. Assessing new tools for management of the pepper weevil (Coleoptera: Curculionidae) in greenhouse and field pepper crops. *Journal of Economic Entomology*. 113: 1903-1912.
2. Fernandez, C., van Laerhoven, S., and Labbe, R. 202X. An overview of the pepper weevil (*Anthonomus eugenii* [Coleoptera: Curculionidae]) in North America. Manuscript currently in review for *Journal of Integrated Pest Management* ID JIPM-2020-0045.
3. Labbe, R. 2020. New tools for pepper weevil management. OctoberPest virtual seminar delivered to the Ontario Greenhouse Vegetable Growers (October 28 2020).
4. Labbe, R. Pepper weevil research update. Virtual Ontario Entomology Researcher Meeting (September 11, 2020).
5. Leo, S. Scott-Dupree, C., and Labbe, R. 2020. Biological control potential of *Jaliscoa hunteri* for suppression of the pepper weevil. Canadian Greenhouse Conference (Poster, October 2020).
6. Fernandez, C., Van Laerhoven, S. and Labbe, R. 2020. Cold tolerance of the pepper weevil. Canadian Greenhouse Conference (Poster October 2020).
7. McCreary, C. and Labbe, R. 2020. How to know when your weevil is evil - Greenhouse Canada. Published in *Greenhouse Canada Magazine* (June 1, 2020).

## COVID-19 Related Challenges:

Work associated with investigating rearing parameters for pepper weevil (**objective 1**), non-target product testing (**objective 3**) and parasitism of the pepper weevil (**objective 4**) will be at least in part delayed or not possible due to the limited access our team members had to research facilities for the better part of 2020.

**Key Message(s):**

While COVID-19 has affected our progress on completing non-target testing as well as studying the parasitism of pepper weevil, we were able to complete and publish pesticide product testing as well as initiate our study of the SIT for pepper weevil control.

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