

Canadian Agri-Science Cluster for Horticulture 3



Update to Industry

Semi-Annual 2021-2022 – Fall 2021

Activity title: Optimizing *Delia* pest monitoring and management in vegetable brassicas

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Activity Objectives (as per approved workplan):

The overarching goal of our project is essentially to improve management practices for *Delia* pests of vegetable brassicas in Canada. To reach that goal, we have developed the following five objectives (listed as activities below):

1. Document and compare the relative contribution of different *Delia* species and genetic lines to crop damage in 6 Canadian provinces (BC, ON, QC, NS, PEI, NB)
2. Develop threshold-based models for conventional management of *Delia* pests
3. Document the development, host preferences and reproductive compatibility of two genetic lines (N-line and H-line) of seedcorn maggot (*Delia platura*)
4. Investigate selected soil parameters as oviposition stimulants in two genetic lines of *D. platura*
5. Validate and optimize the sterile insect release method for cabbage maggot (*Delia radicum*).

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

Activity 1. All *Delia* samples from 2019 have been identified and samples from 2020 are undergoing molecular ID. DNA has been extracted for most (1245/1387) and HRM identification is 30% completed. Preliminary data analyses have been conducted on the abundance and distribution of species by crop type. Preliminary results have been presented on April 6, 2021.

Activity 2. In 2021 three brassica fields - one rutabaga, one cabbage and one broccoli/cabbage mixed field were monitored for eggs, larvae and damage at least six times during the growing season (June to September). Post-harvest damage data were collected in the rutabaga field and in half of the broccoli mixed field. Remaining cabbage samples are underwater due to the unprecedented flooding in the Sumas Prairie of B.C. *Delia* material was subsampled and all specimens identified as *D. radicum*.

Activity 3. Laboratory colonies of both genetic lines of *D. platura* were refreshed with wild specimens. Optimal mating conditions (number of individuals and sex ratio) and the timing for maximum oviposition have been compared for both genetic lines. Preliminary data analysis comparing the developmental times of the two genetic lines at different temperatures has been completed. Data collection of host preference of the two genotypes in a no-choice has been completed for both genotypes and preliminary data analysis started. Data collection is near-complete for host preference in a choice setting for both genetic lines. Data collection on the reproductive isolation (inter-line crosses) and development of hybrid progeny has been completed (data analysis pending). Results were presented at multiples events (see below)

Activity 4. Soil attractiveness for oviposition has been compared for both genetic lines of *D. platura* when in presence of seedling and/or lettuce debris aged between 2 and 28 days. A similar experiment will be conducted this winter with barley debris which is used as an intercrop in onion production. Final analysis of developmental parameters and egg survival is underway.

Activity 5. Over 3,2 M cabbage flies were produced, sterilized and released in daikon and cauliflower fields in QC during 2021. Releases have also been made in NS in radish and broccoli crops. Seven pairs of fields (SIT vs conventional or untreated) were compared for adult catches, sterile/wild ratios and damages. Data on adult sterility and male competitiveness in irradiated flies were also collected, and we were able to confirm that the long-distance shipment of pupae (from QC to NS) did not affect specimen quality. The experiment on the establishment of diapause termination factors was completed. Analysis of pupae quality, male survivorship, and female fecundity in relation to temperature, cold shock and hypoxia is underway. The production of diapausing pupae on the newly developed artificial diet has been confirmed. The emergence rates of these pupae is under investigation after cold storage periods varying from 24 to 32 weeks.

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

1-Bush-Beaupré, A., Fortier, A-M., Fournier, F., Bélisle, M., Savage, S. 2021. Comportement reproductif et traits d'histoire de vie de deux génotypes de la mouche des semis, *Delia platura*. Réunion annuelle de la Société d'entomologie du Québec Nov 25-26 (online).

2-Bush-Beaupré, A., Fortier, A-M., Fournier, F., Bélisle, M., Savage, S. 2021. Comparing the reproductive behavior and life-history strategies of the seedcorn maggot's (*Delia platura*) H- and N- lines. Annual meeting of the Entomological Society of Canada, Nov 15-18 (online).

3-Bush-Beaupré, A., Fortier, A-M., Fournier, F., Bélisle, M., Savage, S. 2021. Comportement reproductif et traits d'histoire de vie de la mouche des semis (*Delia platura*). Réunion annuelle de la Société québécoise de l'étude du comportement. Nov 5-7, Sherbrooke, QC.

4-Fortier, A-M. La technique d'insectes stériles (TIS) pour contrôler la mouche du chou : une alternative au contrôle chimique? Réunion annuelle de la Société d'entomologie du Québec Nov 25-26 (online).

5-Fournier, F. 2021. Établissement des conditions optimales d'entrée et de sortie de diapause pour la production massive de la mouche du chou (*Delia radicum*). Réunion annuelle de la Société d'entomologie du Québec Nov 25-26 (online).

In addition, a round table event was organized on April 6, 2021 by J. Savage involving all Quebec researchers with active projects on *Delia* flies (8 participants). Progress reports were presented to the group for activities 1 (J. Savage), 3 (MSC student A. Bush-Beaupré), 4 (F. Fournier) and 5 (A.-M. Fortier).

COVID-19 Related Challenges:

Activity 2: One item on the original workplan was to sample a QC field in addition to the BC fields. Because COVID delayed the data analysis section for material collected in BC in 2020 this objective has been moved to year 5 of the work plan. Activities 1, 3, 4, 5: We report no impacts of COVID on these activities for the period of April 1-November 30 2021.

Key Message(s):

Overall, the project is progressing well and we are happy to report that we have managed to overcome most challenges and delays caused by COVID in the previous as well as the current fiscal year.

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