

# Canadian Agri-Science Cluster for Horticulture 3



## Update to Industry

### 2020-21 – Semi-Annual

**Activity title:**

Activity 8 - 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 activities:

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.** *Delia* larvae were collected in 6 Canadian provinces (QC, PEI, NB, NS, ON, BC) during the summers of 2019 and 2020. Ninety percent of the samples from 2019 have been identified, and samples from 2020 are currently being sorted and will be sent for molecular identification this winter.

**Activity 2.** Four commercial, conventionally-farmed brassica fields in BC were monitored for *Delia* during the 2020 field season. All fields were sampled intensively for eggs, maggots and obvious damage on 5-6 dates during the season, and for root damage at harvest. Formal data processing still needs to occur.

**Activity 3.** Evaluation of egg hatching rate in relation to temperature is completed for both genetic lines, the results await analysis for a complete comparison of their development in relation to temperatures. Similarly, larval developmental time of the N-line has been completed under selected temperatures. The comparison with H-line developmental characteristics will be possible. A sound protocol for the evaluation of host preference of both lines has been developed. Female age for maturation has been evaluated for both genetic lines. Attractiveness of sterile vs non-sterile organic soil with or without germinating seeds at the radicle stage has also been evaluated. Host preference between different crop seeds in nonsterile soil will take place shortly.

**Activity 4.** Egg survival of the H-line was evaluated in relation to muck soil relative humidity and temperature. This experiment is almost completed for the H-line and will be completed in December for the N-line.

**Activity 5.** Comparison of the best artificial diet with rutabaga on large trays over three consecutive generations have been completed, with the evaluation of the optimal egg inoculation rate. The evaluation of the diet developed under diapausing conditions will be done in the winter of 2021.

A second assay of diapause induction has been conducted. Five different treatments were applied in order to increase emergence rates. Emergence rates of samples increased linearly with cold storage duration and varied a lot among batches. These variable emergence rates are an indication that diapause completion was not optimal. A finer analysis must be conducted to consider production parameters.

Production of diapausing pupae on the new artificial diet developed in this project is under way to confirm that the conditions for diapause induction can be used for the mass production of the cabbage maggot on this diet.

About 3.7 million cabbage flies were produced, sterilized and released in daikon, cauliflower, broccoli and radish fields during 2020. Five pairs of fields (treated vs conventional/untreated) were compared for adult catches, sterile/natural ratios and damages. Data on adult sterility and male competitiveness in irradiated flies were also collected.

Mating compatibility between sterile flies (from QC) and wild populations from NS/PEI could not be evaluated (see below).

**Extension Activities (presentations to growers, articles, poster presentations, etc.):** None to date.

#### **COVID-19 Related Challenges:**

**Activity 1.** Sampling for *Delia* larvae across the various participating provinces was quite challenging due to the COVID-related provincial-level restrictions placed on research activities. Overall, the number of samples collected in the 2020 season was reduced because the sampling season started later than anticipated (mid-May to June, as opposed early-May), fewer assistants could be hired to collect samples and fewer fields could be sampled. For example, in 2019, 73 fields were sampled, whereas in 2020 only 65 fields were sampled, despite plans to sample more fields in 2020 than in 2019.

Activities were most affected in provinces where field sampling was led by AAFC collaborators (NB, NS, ON). Specifically, in NB, the number of fields sampled had to be reduced and they were not permitted to have students participate in fieldwork. In ON (and PEI), access to fields was restricted until late-May and they had difficulty finding new cooperating farmers and fields since in person meetings were not possible and farmers were hesitant in having unknown and unnecessary workers on their farms. In Nova Scotia, sampling was not possible until mid-June and access to fields was only permitted on AAFC property. For BC and QC, field sampling was mostly unaffected and proceeded as planned.

**Activity 2.** No specific COVID-related challenges to note.

**Activity 3 & 4.** Severe laboratory access limitations for a period of 4 months has slowed down laboratory research activities. Host preference evaluation will be conducted as scheduled but the evaluation of performance by genetic lines could be limited. In addition, experiments on larval survival and colonization of plants had just begun and were affected by laboratory access limitations. There will probably be a reduction of the number of distances tested (from larva to plant) in this experiment.

**Activity 5.** The evaluation of egg sterility in fields could not be conducted due to a lack of human resources and field access. Late access to the fields due to COVID and the hot and dry climate did not allow collaborators in NS/PEI to collect pupae. We plan to evaluate this objective next season, concurrently with field release of irradiated *D. radicum*.

#### **Key Message(s):**

Overall, the project is progressing well and aside from irrecoverable losses for activity 1 we consider the impacts of COVID to be minor on our ability to deliver results.

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