

Canadian Agri-Science Cluster for Horticulture 3



Update to Industry

2020-21 – Semi-Annual

Activity title:

Activity 11 - Generate and Evaluate Integrated Pest Management Tools for Wireworm Control in Potatoes in Canada

Name of Lead Researcher: Dr. Christine Noronha, AAFC

Names of Collaborators and Institutions:

Dr. Wim Van Herk (Agassiz Research and Development Centre)
 Dr. Gerhard Greis (Simon Fraser University)
 Dr. Haley Catton (Lethbridge Research and Development Centre)
 Dr. Ian Scott (London Research and Development Centre)
 Dr. Andrew Mackenzie-Gopsill (Charlottetown Research and Development Centre)

Activity Objectives (as per approved workplan):

Objective 1: Test the efficacy of new insecticides to control wireworms and click beetles.
 Objective 2: Evaluate an integrated approach to manage wireworm damage.
 Objective 3: Identify and apply novel click beetle monitoring tools.
 Objective 4: Surveillance of click beetle expansion in Canadian potato growing regions.

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

Due to COVID-19 restrictions, it was not possible to conduct insecticide field trials in PEI, BC and ON. In lieu of field studies, a lab study to determine the potential residues of soil insecticides applied in field trials the previous year was undertaken in BC and insecticide screening lab study are planned for BC and PEI.

The crop rotation trial using Barley, Buckwheat, Flax and Sorghum Sudangrass continued with potatoes planted in 2020. Tubers were harvested and are being evaluated. The two year crop rotation trial was planted and data on crop biometrics, biomass and wireworm numbers per plot were collected. The second year of the IPM study using NELT's to trap females continued in growers' fields in PEI. A microplot trial was setup in ON to compare the effectiveness of two wireworm sampling methods under different cover crop conditions: bare soil, buckwheat or barley growth. The findings indicate that only in the buckwheat treatment was there a significantly ($P < 0.0001$) higher number of wireworm captured by baits versus sampling. In Lethbridge, one greenhouse experiment comparing wireworm growth on different crops was partially completed in 2019-2020, but had to be shut down early due to COVID-19. No work was done on this project in 2020-2021 due to lack of approval to field collect wireworm. A field experiment to evaluate weed suppression of wireworm suppressing cover crops concluded in 2020. This experiment compared the use of brown mustard, buckwheat, timothy and a mixture of hairy vetch, crimson clover and annual rye terminated at peak flowering via four different methods, disk, mow and disk, glyphosate, and roller-crimped on weed suppression in-season and in the subsequent year. Soil cores for seedbank assessment were collected in the spring and weed populations assessed in-season. Data analysis remains on-going.

Due to the delayed start in field activities virgin females and males of *Hypnoidus abbreviatus* could not be collected for pheromone extraction. Click beetles were collected, sexed and identified to species, and used for pheromone extraction at Simon Fraser University (SFU; Drs. Gerhard and Regine Gries) (BC). Potential pheromones were identified for *Agriotes mancus* and *A. ferrugineipennis*, and sufficient material was synthesized for field testing. Successful field tests were conducted for *L. canus*, *L. infuscatus*, *L. californicus* complex in BC, Alberta, Washington, Idaho, and Montana; for *A. mancus* in Quebec, and for *Selatosomus destructor* in Alberta. Some preliminary field testing was also done for *A. ferrugineipennis* (BC) and *L. agonus* (Ontario). Electroretinogram (ERG) recordings to determine the spectral sensitivity of seven pest species (*A. lineatus*, *A. obscurus*, *A. pubescens*, *A. ferrugineipennis*, *Corymbitodes lobata*, *Selatosomus destructor* and *Limonius canus*) was conducted.

Wireworm and click beetle specimens (>4,000) were collected or received from BC (Vancouver Island, Pemberton, Okanagan), southern Alberta, southern Manitoba, southern Ontario, Quebec, Washington, Oregon, Idaho, and Montana, and identified to species by Dr. van Herk, with the assistance of Drs. Hume Douglas and Frank Etzler (elaterid taxonomists). Pest wireworm distribution maps for Alberta, Saskatchewan, and Manitoba were prepared and distribution data analyzed.

Extension activities for the project have continued.

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

K Singleton, AJ Blake, **W van Herk**, G Gries. 2020 "Spectral sensitivity of North American pest click beetle species (Coleoptera: Elateridae)." Entomological Society of America—Virtual Meeting. November 11-25 (10 min)

EA Lemke, **W van Herk**, H Catton, S Meers, K Wanner, R Cooper, J Serrano, A Rashed, JL Smith, R Gries, A Nikoukar, G Gries, S Alamsetti. 2020. "Efficacy of synthetic *Limonius* sex pheromone on trap captures of four *Limonius* spp. (Coleoptera: Elateridae) in various locations across North America. Entomological Society of America—Virtual Meeting. November 11-25 (10 min)

EA Lemke, **W van Herk**, H Catton, S Meers, K Wanner, R Cooper, J Serrano, A Rashed, JL Smith, R Gries, A Nikoukar, S Alamsetti, G Gries. 2020. "Efficacy of synthetic *Limonius* sex pheromone on trap captures of four *Limonius* spp. (Coleoptera: Elateridae) in various locations across North America." Entomological Society of Alberta—Virtual Meeting. October 22-23 (15 min)

K Singleton, AJ Blake, **W van Herk**, G Gries. 2020 "Spectral sensitivity of North American pest click beetle species (Coleoptera: Elateridae)." Entomological Society of British Columbia —Virtual Meeting. October 26 (15 min)

EA Lemke, **W van Herk**, H Catton, S Meers, K Wanner, R Cooper, J Serrano, A Rashed, JL Smith, R Gries, A Nikoukar, S Alamsetti, G Gries. 2020. "Efficacy of synthetic *Limonius* sex pheromone on trap captures of four *Limonius* spp. (Coleoptera: Elateridae) in various locations across North America." Entomological Society of British Columbia—Virtual Meeting. October 26 (15 min)

Posters:

H Caton, **W van Herk**. "Wireworm in wheat in southern Alberta, Canada." Entomological Society of America—Virtual Meeting. November 11-25.

Catton, H., Van Herk, W. 2020. Wireworm in southern Alberta spring wheat is dominated by 3 species and does not vary with crop rotation. Entomology 2020: Entomological Society of America Virtual Annual Meeting, November 11-25, 2020. Virtual meeting. Poster presentation.

Haley Catton and wireworms featured in agricultural media articles:

Barker, B. 2020. Searching for wireworms. Top Crop Manager Magazine, Western Edition. April 2020:28-30.
<https://mydigitalpublication.com/publication/?m=1031&i=654792&p=28>

Simes, J. 2020. Now is the best time to scout for cutworms, wireworms. Western Producer. May 28, 2020. <https://www.producer.com/2020/05/now-is-best-time-to-scout-for-cutworms-wireworms/>

Arnason, R. 2020. Wireworms prove tricky to keep under control. Western Producer. September 24, 2020. <https://www.producer.com/2020/09/wireworms-prove-tricky-to-keep-under-control/>

Arnason, R. 2020. Feds approve wireworm insecticide. Western Producer. October 23, 2020. <https://www.producer.com/2020/10/feds-approve-wireworm-insecticide/>

Christine Noronha. 2020. Wireworm practical research advice. Potato news. 21(3): 9-12 https://peipotatoagronomy.com/wp-content/uploads/2020/08/PEIPN_mayjun20.pdf/

Noronha featured in agricultural magazine articles.

Ashley Robinson 2020. Solving the Wireworm Problem . Spudsmart. 24-26. Fall 2020. https://spudsmart.com/ss_fall2020/?page=26

Ashley Robinson. 2020. Working together on research. Spudsmart. 30-33. Summer 2020. https://spudsmart.com/ss_summer2020/?page=32

COVID-19 Related Challenges:

COVID restrictions resulted in the inability to conduct some field trials or travel to field sites. Collection of wireworms from the field to conduct laboratory studies was a major challenge for all collaborators. This may result in some laboratory trials, which were planned to substitute for the inability to conduct field trials, being scaled back. One of two sites (Fredericton) weed seed bank sites was not planted to potatoes to evaluate effects of cover crops in rotation. Restricted access to laboratories resulted in no soil cores being processed to date for evaluation of the weed seedbank. In Lethbridge, COVID-19 prevented wireworm work in the field in 2020. Because wireworms could not be collected from the field, no lab/greenhouse experiments could be conducted 2020-21. However extension activities are continuing for all collaborators. In London ON, although field insecticide trials could not be conducted, new field sites were located in the hope of setting up insecticide efficacy trials in 2021.

Key Message(s):

COVID-19 restrictions limited some field activities however, plans were made to substitute these field trials with laboratory/greenhouse based trials. The scale of these experiments would depend on the ability to collect enough wireworms to conduct the trials. We hope to be able to conduct all field trials next year.

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