

Canadian Agri-Science Cluster for Horticulture 3



Update to Industry

2018-2019

Activity title:

Development of Regional Management Strategies and Decision Making Tools for Control of Colorado Potato Beetle

Name of Lead Researcher:

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Names of Collaborators and Institutions:

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Activity Objectives (as per approved workplan):

OBJECTIVES: Our overall objective is to reduce economic losses to potato in Canadian growing regions due to herbivory by the Colorado potato beetle (CPB). Specifically, we aim to determine local susceptibility of CPB populations to several classes of insecticides through a national resistance-monitoring network, improve resistance management, better characterize the molecular basis of developing resistance, and develop novel extension tools to improve management practices. To accomplish this, the deliverables are divided into four objectives as follows:

1. Determine susceptibility of Colorado potato beetle populations to multiple classes of insecticides in different potato growing regions in Canada;
2. Develop an interactive online mapping tool for growers to access results of susceptibility surveys to inform local decision making for optimal insecticide selection;
3. Identify molecular signatures of insecticide resistance that can be used to monitor the occurrence and spread of resistance in regional CPB populations and identify new pest control targets;
4. Develop a novel resistance monitoring tool for extension and diagnostic labs as a within-season decision making tool, based on molecular signatures of developing resistance



Research Progress to Date (use plain language):

A total of thirty-seven populations of Colorado potato beetle were obtained from six provinces – AB (3), MB (8), ON (6), QC (7), PE(7), NB (6 – all AAFC or project partner property) - for insecticide resistance screening in 2018. Insecticide use surveys accompanied most populations submitted and indicated that in the last five years, 69% of respondents had applied neonicotinoids, 40% had applied spinosyns, 21% had applied diamides and 21% had applied pyrethroids.

Populations of Colorado potato beetle sampled in Alberta show good susceptibility at this time to all classes of insecticides tested. In Manitoba, development of resistance to neonicotinoids and spinosyns is evident at half of the sites sampled. Associations between past insecticide use and development of resistance are still being analyzed, but data available to date indicate the development of some cross-resistance in at least one Manitoba population, with multiple applications of Entrust being associated with resistance to Delegate. In Ontario, good susceptibility remained for Coragen and at several sites also to Actara, Delegate, and Entrust. Development of resistance to Entrust, Titan, and Delegate was observed at some sites, with reduced susceptibility to at least one class of insecticide observed in all populations. In Quebec, resistance to Entrust was observed in four of seven populations, with reduced susceptibility being observed in one additional population. Reduced susceptibility to Delegate and Verimark were also noted. In PEI, no development of resistance was detected in any of the seven populations sampled, however reduced susceptibility to the spinosyns Delegate and Entrust was detected at four of eight sites. On the AAFC/partner lands surveyed in NB, frequent reduced susceptibility or resistance to Entrust (4/6 populations), was observed, with two populations of these populations additionally showing reduced susceptibility to Actara and Verimark.

In preparation for the 2019 survey, further refinements to the collection program, potato production, insect rearing and bioassay protocols are being undertaken. Further resolution of the geographic coordinates for sample sites will be requested in order to develop the mapping tool, however the specific locations of collections will not be released and data represented per raster grid cell (size to be determined based on available data).

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

Scott, I.M. 2018. Insecticide resistance and the Colorado potato beetle. Invited presentation for the Biochemistry Department, Universite de Moncton, Moncton NB, April 27, 2018.

Ibarra, S., Moffat, C.E. and Scott, I.M. Colorado Potato Beetle: Insecticide Resistance. PEI Potato Conference & Tradeshow, Charlottetown, PE, February 20, 2019.

Early Outcomes (if any) or Challenges:

Key Message(s):

Early results from the 2018 field season demonstrate strong regional patterns in the development of resistance in Colorado potato beetle populations, with different classes of insecticides showing regional variation in efficacy. We will continue resistance screening in the 2019 field season (obj. 1) to increase the scope of our surveys, initiate work on the development of the online resistance mapping tool (obj. 2) and initiate work on identifying the molecular signatures of insecticide resistance (obj. 3) as outlined in the work plan. We thank our partners for their ongoing contributions and collaboration to ensure the success of the project.

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