

Canadian Agri-Science Cluster for Horticulture 3



Update to Industry

Semi-Annual – Spring 2022

Activity title: Common Scab: Increasing profitability of Canadian potato producers by controlling common scab.

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Activity Objectives (as per the approved work plan):

Common scab results in significant economic losses every year in Canada. Common scab symptoms are characterized by brownish lesions on potato tubers that can result in declassification of tubers in seed production, rejection for the table market and difficulty in peeling the tubers leading to significant losses in the processing industry. There is currently no chemical registered specifically to control common scab in Canada.

The overall objective of the project is to evaluate several methods to control common scab of potato under a range of environmental conditions and soil types across Canada.

The specific objectives of this project are to:

Sub-activity 1.1 Characterize the genetic diversity of *Streptomyces* spp. causing common scab and develop tools to measure specific genotype,

Sub-activity 1.2. Evaluate methods to control common scab using small plot and field-scale trials in commercial potato fields,

Sub-activity 1.3. Determine the effect of common scab control methods on soil health and quality parameters,

Sub-Activity 1.4. Determine the concentrations of soil isothiocyanates produced through the degradation of a mustard meal and mustard residues

Sub-Activity 1.5. Evaluate the effect of common scab control methods on microbial communities.

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

Sub-activity 1.1 A collection of pathogenic *Streptomyces* spp. isolates obtained from common scab infected tubers. The isolates were classified into more than 20 genetically-different groups using a molecular method and belonged to *S. scabies* and *S. acidiscabies*. Genome sequencing of representative isolates is ongoing.

Fourteen novel qPCR bioassays were developed to detect and quantify specific *Streptomyces* species or strains. The abundance of these 14 specific species/strains of *Streptomyces* spp. is currently being measured in various PEI soil samples.

Sub-activity 1.2.1 The efficacy of different auxin-based products including 2,4-D Ester, Fruitone and Rejuvenate in controlling common scab was evaluated in MB (Peak of the Market), NB (AAFC), and PEI (Cavendish Farms and AAFC) in summer 2021. 2,4-D Ester significantly reduced common severity in NB (Red Norland) and MB (Peregrine and Musica) but not in PEI (Prospect, Shepody and Red Norland). Foliar application of Rejuvenate reduced common scab severity on Shepody but not Prospect. Fruitone did not control the disease. The results indicated that differences in potato varieties, soil properties, the aggressiveness of the pathogen, and environmental conditions among sites affected the control efficacy of the auxin-based products and that more investigations are required to understand how best to use auxin-based products to control common scab.

Sub-activity 1.2.2. Field studies in PEI

The effect of the rotation crop system on common scab severity in commercial potato fields was evaluated. In summer 2021, four field sites in PEI with different previous rotational crop splits were used as follows: 1) brown mustard vs multi-mix species, 2) corn irrigated vs non-irrigated, 3) pea irrigated vs non-irrigated, 4) sorghum Sudan grass vs ryegrass vs tillage radish. Potato fields with a prior crop history of peas or corn had very low common scab (1%) and no significant differences between treatments. There were more common scab lesions (2.4 %) observed in the potato crop following the multi-species mix compared with brown mustard (1.3%). More common scab lesions (12.1 %) were observed in the potato crop following ryegrass compared to radish (8.7%) or sorghum sudan grass (7.3%).

Sub-activity 1.3. 2,4-D is known to increase ethylene production in plants resulting in the activation of plant defense mechanisms that could reduce the abundance of pathogenic *Streptomyces* spp. At the NB site, the two foliar applications of 2,4-D Ester resulted in a 6-fold decrease in the abundance of the pathogenic *Streptomyces* spp. population in the soil close to the roots compared to the control. The results showed that the abundance of the common scab pathogen was reduced in the rhizosphere soil of Red Norland and a concomitant reduction in common scab severity was observed suggesting that this might be a possible mechanism by which 2,4-D Ester decreased the severity of common scab. However, more investigations are required to confirm this result.

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

Presentations to growers

Shinners-Carnelley, Tracy. 2021. Presented field trials and preliminary results to control common scab to growers. Peak of the Market Field Day, Winkler, August 12th.

Yorinori, Newton. 2021. Presented field trials and preliminary results to control common scab to growers. Cavendish Field Day, Annan, PEI. September 17th.

Peters, Rick. 2021. Presentation on the impact of rotation crops on common scab - 2020 split fields at the East Prince Agri-Environment Meeting. Emerald, PE. (attended virtually), January 27

Knowledge transfer products

Goyer, C. 2022. Article for Fresh Thinking magazine entitled 'Common Scab; Increasing Profitability of Canadian Potato Producers by Controlling Common Scab' by Paul Adair. January 2022.

Goyer, C. 2022. Article for Spudsmart magazine entitled 'Getting to the Bottom of Common Scab' by Ashley Robinson. January 2022.

Peters, Rick. 2020. Television interview for CBC News done by Nancy Russell on research focusing on the management of common scab. September 29

Peters, Rick. 2020. News Release for CBC News titled 'P.E.I. research scientists look for ways to grow scab-resistant potato' done by Nancy Russell. Posted October 2, 2020 at 6:00 am.

<https://www.cbc.ca/news/canada/prince-edward-island/pei-potato-research-scab-1.5745940>

Scientific publication

Hudec, C., Biessy, A., Novinscak, A., St-Onge, R., Lamarre, S., Blom, J., et al. 2021. Comparative genomics of potato common scab-causing *Streptomyces* spp. displaying varying virulence. *Front. Microbiol.* 12:716522. 10.3389/fmicb.2021.716522

COVID-19 Related Challenges:
COVID19 required sanitary precautions and paperwork thus complicating the field season but the trials went ahead without changes. There were no interruptions of the laboratory work however, work proceeded with extra sanitary precautions and paperwork.

Key Message(s):
This project has demonstrated that 2,4-D Ester is a promising method to control common scab. More investigation on the rate of application and timing of application of the auxin-based products is required to increase their efficacy and reliability in controlling common scab. This project has improved our understanding of the diversity of the common scab pathogen and led to the development of detection methods that target specific species or strains of the common scab pathogen.

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