

# Canadian Agri-Science Cluster for Horticulture 3



## Update to Industry

### Semi-Annual – Spring 2021

<p><b>Activity title:</b> Common Scab: Increasing profitability of Canadian potato producers by controlling common scab</p>
<p><b>Name of Lead Researcher:</b> Claudia Goyer, Agriculture and Agri-Food Canada (AAFC), Fredericton, NB</p>
<p><b>Names of Collaborators and Institutions:</b> Rick Peters (AAFC Charlottetown), Bernie Zebarth (AAFC, Fredericton), Louis-Pierre-Comeau (AAFC, Fredericton), Martin Filion (université de Moncton), Newton Yorinori (Cavendish Farms), Tracy Shinnors-Carnelley (Peak of the Market), David MacMullin (University of Carleton), Mario Tenuta (University of Manitoba), Khalil Al-Mughrabi (New Brunswick Department of Agriculture, Aquaculture and Fisheries).</p>
<p><b>Activity Objectives (as per approved workplan):</b> 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.</p> <p>The specific objectives of this project are to:</p> <p><b>Sub-activity 1.1</b> Characterize the genetic diversity of <i>Streptomyces</i> spp. causing common scab and develop tools to measure specific genotype,  <b>Sub-activity 1.2.</b> Evaluate methods to control common scab using small plot and field-scale trials in commercial potato fields,  <b>Sub-activity 1.3.</b> Determine the effect of common scab control methods on soil health and quality parameters,  <b>Sub-Activity 1.4.</b> Determining the concentrations of soil isothiocyanates,  <b>Sub-Activity 1.5.</b> Evaluate the effect of common scab control methods on microbial communities.</p>
<p><b>Sub-activity 1.1. Martin Filion, University de Moncton.</b> Pathogenic <i>Streptomyces</i> spp. causing common scab were isolated from tubers of NB, PEI, QC and MB. They were classified using a molecular technique named rep-PCR into more than 20 genetically different groups, so far, and some isolates belonged to <i>S. scabies</i> and <i>S. acidiscabies</i>. Ten novel qPCR bioassays were developed to detect and quantify specific <i>Streptomyces</i> species. This work is ongoing thus additional genetic groups may be identified, and more bioassays are under development.</p> <p><b>Sub-activity 1.2.1. A. Studies in PEI (Newton Yorinori, Cavendish Farms):</b> A field trial was done to compare two peroxide-based products and a biofertilizer to a control for their efficacy to control common scab at the Cavendish Farms research plots. The products were applied in-furrow and at hilling (on the side of the hills). None of the products reduced common scab severity or incidence however, the trial was not irrigated thus the dry weather during July and August might not allow the product to be re-distributed in the soil to reach the tuber zone. A trial under irrigation to test these products is planned for summer 2021.</p> <p><b>1.2.1 B. Study in MB (Tracy Shinnors-Carnelley, Peak of the Market):</b> The treatments evaluated included 1) Serenade Soil (SS) in-furrow, 2) barley as a nurse crop, 3) barley nurse crop plus SS, 4) composted beef manure (CBM), 5) CBM+SS, liquid mustard at 6) 2.5 and 7) 5 gallons/ acre, 8) 2,4-D Ester and 9) control (untreated). The nurse crop failed to establish. SS and CBM+SS reduced common scab severity by about 40% compared to the control. The foliar application of 2,4-D Ester decreased common scab severity by 69% compared with the control. Trials treated with SS</p>

and 2,4-D resulted in 20% and 70% marketable tubers compared to 5% in the untreated control. Other treatments did not control common scab.

### 1.2.2 Studies in PEI (Rick Peters, AAFC)

**Study 1:** To test the effect of prior rotation crops on common scab severity, three commercial fields in central PEI with different previous rotational crop splits were used. The rotation crops included: 1) oats vs sorghum-sudangrass, 2) brown mustard/deep tillage radish vs brown mustard/sorghum-sudangrass, 3) barley vs brown mustard. Although the summer was dry, common scab severity was low (1-7%). No significant difference in common scab severity and incidence was recorded between splits in any of the three fields.

**Study 2:** The effect of fertilizer-based products including 1) Tropicote (CaNO<sub>3</sub>), 2) ammonium sulfate, 3) elemental sulfur and 4) ammonium nitrate (control) on common scab was tested in Harrington Research farm. The Tropicote treatment had significantly greater common scab severity (37%) compared to ammonium nitrate (25%) or ammonium nitrate and elemental sulfur (26%) while the ammonium sulfate treatment had 29%. The results confirmed that the sulfur-based fertilizers did not control common scab under the field conditions of this study.

**Sub-activity 1.3. Quantification of pathogenic *Streptomyces* from soils (Claudia Goyer, AAFC).** Tubers in MB frequently present symptoms that are not typical of common scab or russetting complicating the disease evaluation. The abundance of pathogenic *Streptomyces* spp. was quantified from tubers with russetting and silver patch, an unknown tuber blemish characterized by large silvery areas. Although, the silver batch is very atypical of symptoms of common scab, the presence of pathogenic *Streptomyces* spp causing common scab was tested to rule it out. Controls consisted of healthy tubers and tubers with typical common scab symptoms. The pathogenic *Streptomyces* spp. ranged from  $1.5 \times 10^4$  and  $1.3 \times 10^5$  cells g<sup>-1</sup> of tuber in tubers with typical common scab lesions while they were not detected in healthy tubers or russetting. The results suggest that russetting symptoms in MB might not be caused by common scab, however, it cannot be ruled out that the abundance of the pathogenic *Streptomyces* spp. was below detection.

**Sub-Activity 1.4. David McMullin, University of Carleton.** Due to COVID19, this activity was not completed however, research activities were moved to the next fiscal year.

**Sub-Activity 1.5. Claudia Goyer, AAFC.** Possible relationships between the diversity and richness of microbial communities and the abundance of the pathogenic *Streptomyces* spp. causing common scab or disease severity will be evaluated on trials where the common scab was successfully controlled.

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

1. Shinnars-Carnelley, Tracy. Presented field trials and preliminary results to control common scab to growers. Peak of the Market Field Day, Winkler, August 13th, 2020.
2. Shinnars-Carnelley, Tracy. Presented results of 2020 field trials to growers. Peak of the Market Virtual Research Seminar, January 13th, 2021.
3. Yorinori, Newton. 2020. Presented field trials and preliminary results to control common scab to growers. Cavendish Field Day, Annan, PEI. September 25th.
4. Media article in Terre de Chez-Nous. Title: Gale commune: Des chercheurs...qui trouvent! March 10, 2021. Interviewed by Olivier Grégoire.

### Early Outcomes (if any) or Challenges:

- COVID19 has posed serious challenges in establishing field trials and resulted in a 6-month closure of laboratories at Agriculture and Agri-Food Canada, Université de Moncton and Carleton University. Despite this, significant progress was made or activities planned at Carleton University were postponed until the fiscal year 2021/2022.
- A collection of pathogenic *Streptomyces* spp. isolates obtained from common scab lesions of tubers originating from PEI, NB and MB were classified into more than 20 genetically different groups, so far, and some isolates belonged to *S. scabies* and *S. acidiscabies* species. Tool to quantify specific species were developed.

- Results so far indicated that nurse crops, composted beef manure, liquid mustard, peroxide-based products and fertilizer-based products were not effective in controlling common scab.
- Crop rotations including sorghum-sudangrass, 2) brown mustard/deep tillage radish vs brown mustard/sorghum-sudangrass, 3) barley vs brown mustard failed to control common scab.
- The biopesticide Serenade Soil in-furrow and 2,4-D Ester (auxin) reduced common scab severity by 40% and 69%, respectively, resulting in 20% and 70% marketable tubers, respectively, compared to 5% in the untreated control.

**Key Message(s):**

This project has brought a better understanding of the genetic diversity of pathogenic *Streptomyces* spp. responsible for common scab in NB, PEI and MB. The auxin 2,4-D Ester have shown promising results in controlling common scab in MB and this product will be tested in MB, PEI and NB in summer 2021.

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