

Canadian Agri-Science Cluster for Horticulture 3



Update to Industry

Semi-Annual – Fall 2021

Activity title: 2810 - ASC-18-19 Hort Cluster 13A

Late blight: Tracking pathogen strains and their characteristics

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Activity Objectives (as per approved workplan):

The overall objectives of the project are to track the distribution of strains of the late blight pathogen in Canada, determine various important biological characteristics of isolated strains including fungicide sensitivity, with the overall aim of improving disease management and economic returns.

The specific objectives of this project are:

Sub-activity 1.1 Tracking potato strains of *P. infestans* in Canada

To identify strains of *Phytophthora infestans* causing late blight of potato in production areas across Canada and to develop a map showing the distribution of strains in this country.

Sub-activity 1.2 Characterization of novel strains including host/cultivar preference, environmental triggers, fungicide sensitivities, and control options

To assess novel late blight pathogen strains in Canada for their ability to cause disease in above and below-ground tissues of solanaceous plants, and to determine their sensitivity to registered and novel fungicides as well as the optimal environments for infection, spore production and survival (with the aim of understanding the impact of climate change on late blight pathogen population dynamics).

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

Sub-activity 1.1 Tracking potato strains of *P. infestans* in Canada

Late blight was limited in occurrence in 2021. This was likely due to the warm, dry growing conditions in some parts of the country. However, eastern provinces received significant rainfall and conditions that would have been conducive to disease development were present. Lack of disease in the east was most likely due to the lack of pathogen inoculum present, likely due to the lack of disease in recent years. Two occurrences of late blight were found in Ontario in 2021 – one on potato and one on tomato. A total of 6 pathogen isolates were obtained from these samples and preliminary results of pathogen characterization work are indicating that US-23 was once again the strain of concern.

Late blight was not detected in NB on potato or tomato foliage throughout the growing season of 2021. Weather conditions were not conducive for the disease and the inoculum level must have been very low.

In BC, late blight was largely absent from the commercial potato crop, but late season disease (early to late October) in community gardens (mainly tomato) of Fraser Valley areas (Abbotsford, Chilliwack, and Agassiz) allowed the collection of 8 samples from four community gardens. Isolation and purification of *Phytophthora infestans* from 2021 is in progress and we are expecting to have ~ 20 to 30 isolates from BC in 2021.

Several provinces took advantage of late blight forecasting programs in 2021, using a network of weather stations. In many instances, this was also complemented by the use of passive spore traps. In PEI, no spores of the late blight pathogen were detected in 2021. In New Brunswick, a large number of parishes were included in our spore trapping program and sampling was done 3 times a week starting the beginning of June and ending by the end of September. Late blight spores were found in one trap and one location in NB on 12 August 2021 but no crop infection was observed throughout the season.

Critical isolates of *P. infestans* from previous years were maintained as part of critical duties at AAFC Charlottetown and AAFC Agassiz during the Covid-19 pandemic. This has allowed renewed efforts at strain analysis to continue on these collections as lab capacity has increased. At AAFC Charlottetown, assessment of isolates for mating type, fungicide sensitivity, and allozyme and strain genotype is almost complete. Preliminary results of these analyses showed a high level of diversity in isolates from BC, and the potential for the presence of a number of strains, which has significant potential repercussions for disease epidemiology and management.

To understand the genetic diversity of the *Phytophthora infestans* population in BC, 170 strains collected in 2019 and 2020 were characterized using single nucleotide polymorphism (SNP) markers. These strains (n =170) were collected from diverse locations of BC, which includes home gardens and community gardens (tomatoes) as well as commercial potato farms and research stations. Data analyses is in progress. Preliminary analyses of SNP genotyping of these strains indicates that these isolates are very diverse.

Sub-activity 1.2 Characterization of novel strains including host/cultivar preference, environmental triggers, fungicide sensitivities, and control options

In PEI, tuber inoculation studies in storage assessing a wide range of potato varieties for sensitivity to different strains of the late blight pathogen have been initiated. This winter, greenhouse pathogenicity studies using various hosts (potato, tomato and other solanaceous crops) will continue. Greenhouse studies last winter confirmed the effectiveness of tomato varieties with late blight resistance against inoculation with different strains of the pathogen.

In Agassiz BC, growth of *Phytophthora infestans* isolates collected in 2020 was evaluated at temperatures ranging from 5 to 35°C using thermal gradient plate technology. Isolates from 2019 and 2021 will be tested at this temperature range in 2022.

Efficacy trials were conducted by Segun Babarinde, a Ph.D. student working under the supervision of Dr. Khalil Al-Mughrabi and based at Dalhousie University in Truro. Greenhouse experiments investigated the efficacy of various fungicides registered in Canada and commonly used by potato growers for the management of late blight. The experiment was done on the potato variety Russet Burbank. The experiment will be repeated once or twice in order to validate the results.

In MB, under the direction of Dr. Daayf, detached leaves of eleven NRBK differential potato lines were inoculated with a *P. infestans* isolate of the US-24 genotype. Measurement of percent infection was

determined by calculating the percentage of the lesion area of each leaf over the total area of the leaf and further used to calculate the Area under Disease Progress Curve (AUDPC), which allows estimation of the overall accumulated percent infection for each treatment. The results showed that NRBK 5,8,9 lines displayed resistance against the US-24 strain. However moderate infection was observed in NRBK 10 and 11. Pathogenicity trials utilizing other pathogen genotypes are on-going.

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

Presentations

January 28-29, 2021. Pacific Agriculture Show.

Horticultural Growers' Short Course, Lower Mainland Horticulture Improvement Association

Invited Virtual Presentation:

Burlakoti, R. R. and R.D. Peters. Late blight: always an issue for potatoes – implications for home gardeners.

March 9, 2021. Spud Smart Innovation Series Webinar & Podcast.

Virtual event. <https://spudsmart.com/fighting-back-against-late-blight-a-spudsmart-innovation-series-webinar-podcast/>

Conference Proceedings

Burlakoti, R. R. and R.D. Peters. 2021. Late blight: always an issue for potatoes – implications for home gardeners. In: Kabaluk, T. and Frey, L (Eds.) Proceedings of the Lower Mainland Horticulture Improvement Association 62nd Annual Horticulture Growers' Short Course. Abbotsford, BC, January 28-29, 2021. In press.

MacPhail, R.A., Burlakoti, R., Al-Mughrabi, K.I., Daayf, F., Bisht, V., Novinscak, A., Pawanpuneet, R., MacDonald, K., Gregory, D., Crane, B. and Peters, R.D. 2021. Assessment of populations of *Phytophthora infestans* in Canada in 2019 – changing tides. Page 20 in "Proceedings of the Northeast Potato Technology Forum - 2021." Published by McCain Foods Ltd.

<https://northeastpotato.com/wp-content/uploads/2021/03/2021-NEPTF-Abstract-Booklet.pdf>

Interviews Related to the Late Blight Program

October 19, 2020: Ashley Robinson, Associate Editor for SpudSmart

News Releases

A flu shot for potatoes. Ashley Robinson for SpudSmart, Issues Ink. November 23, 2020.

<https://spudsmart.com/a-flu-shot-for-potatoes/>

Research sheds light on late blight strains. Ronda Payne, Country Life in BC. June 2021, page 39.

<https://news.countrylifeinbc.com/june2021#page=39>

Provincial Outreach

Weekly reports on potato diseases and insects were sent to growers and others in the potato industry and information placed on-line (for example, in Manitoba reports were recorded on www.mbpotatoes.ca).

Although challenges due to Covid-19 often still prevented in-person meetings, potato pest updates were discussed in various forums with growers and potato agronomists. These included phone calls, virtual meetings, radio interviews and email/website transmission of information.

COVID-19 Related Challenges:

- Extension activities and distribution of project information were still often in a virtual format.
- Field- and lab-based activities were more normalized in 2021. Collections of pathogen isolates housed at AAFC facilities continued to be maintained as part of critical duties.
- Summer and graduate students resumed more normal activities in 2021, albeit with some restrictions due to Covid-19

Key Message(s):

- Although Covid-19 has presented many challenges for project participants, the team is still on target to meet project goals, due to the excellent support of project partners
- Late blight was not prevalent in most of Canada in 2021, but samples of infected tissue were collected in Ontario and BC
- Preliminary results indicate that US-23 was the likely cause of disease in Ontario; characterization of isolates from BC is in progress. Preliminary analyses of BC isolates with SNP genotyping indicates that these isolates are quite diverse.
- Tomato varieties with genes for late blight resistance are effective against the common pathogen strains found in Canada

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