Canadian Agri-Science Cluster for Horticulture 3

Update to Industry

Semi-Annual – Spring 2022

Activity title: 16A: Variety Evaluation

Name of Lead Researcher: Erica Fava, Agriculture and Agri-Food Canada

Names of Collaborators and Institutions:
AB: Chandra Singh, Lethbridge College; Michele Konschuh, University of Lethbridge; Parkland Seed Potatoes;
BC: Heather Meberg, BC Agriculture in the Classroom, University of the Fraser Valley;
MB: Darin Gibson, Gaia Consulting Ltd; Dr. Tracy Shinners-Carnelley, Peak of the Market;
ON: Dr. J. A. Sullivan and Vanessa Currie, University of Guelph; Ontario Potato Board;
PEI: Mary Kay Sonier, PEI Potato Board; David Main, AAFC Charlottetown; Real Potatoes;
QC: André Gagnon, Progest Inc. 2001.; Sophie Massie – Progest Inc. 2001; Kristine Naess – CRLB
SK : Jazeem Wahab, AAFC Saskatoon

Activity Objectives (as per approved workplan):

This activity aims to enhance the profitability and sustainability of the Canadian potato industry by identifying superior selections that can be produced more efficiently than current potato varieties in major production areas. Evaluations included: adaptation; yield performance (total and marketable); external and internal quality; cook quality; and visually-rated reaction to pests and disease as compared to industry standards when grown under regional conditions at 8 trial sites across Canada. Evaluations were performed on three market types including: French Fry, Fresh Market and Chip types.

-Production of breeder's selection seed at Benton Ridge Substation (NB) and distribution to cooperators for National Potato Variety Trials (NPVT) (10-30 clones)
-Production of breeder's selection seed at Vauxhall Substation (AB) and distribution to cooperators for NPVT (10-30 clones)
-Conduct National Trial in NB (in coordination with NB Ag)- (20-60 clones) site TBD
-Conduct National Trial in Saskatchewan- (20-60 clones) Outlook site
- Conduct National Trial in PEI - (20-60 clones) Harrington site
-Coordination of NPVT and collection of data from all trial sites
-Data analysis and report
-Cooperators meeting to review the data

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

In 2021, all of the objectives above were met. Thirty selections and 8 checks were grown at 9 sites across Canada. The locations included: Prince Edward Island, New Brunswick, Quebec, Ontario, Manitoba (2 locations), Saskatchewan and Alberta with demonstration sites at all locations and in British Columbia.

The AAFC Potato Breeding Program continued with the two tiered trialing system at all National Potato Variety Trial (NPVT) locations. Tier 1 selections are in the first year of the National trialing system at 8 sites (Charlottetown, PEI; Sainte-Croix, QC; Wilmot, NB; Elora, ON-Chip; Winkler, MB; Carberry, MB-French Fry selections; Outlook, SK; Brooks, AB). The Tier 2 selections were grown at the same 8 locations described above. Due to the extreme drought in 2020 at the Benton, NB seed farm, 2 reps were planted if enough seed was available. Particularly effected by the drought were the French Fry selections and preference for site evaluations was given to AB, MB, NB, and PEI. Twenty-one Tier 1 selections were trialed with 8 check varieties and nine Tier 2 selections with 8 check varieties. This included French Fry, Chipping and Fresh Market types. Trials were planted, grown and harvested following commercial production practices common in the local area.

All field data were collected on time and as required. The harvest was also done in a timely manner, but a few of the sites had labour shortages during grading (due to illnesses and isolation requirements) and there were delays getting the harvest data. The season was generally extremely hot and dry in the Western provinces and hot with seasonable precipitation in the Eastern provinces. The variable growing conditions at each location are allowing for evaluation of varieties under a wide range of environments.

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

Most of the field day extensions activities were canceled or reduced this year because of COVID-19. In British Columbia, a socially-distanced field day was had with over 100 attendees that was spread out over a 6 hour period. New Brunswick and Ontario also had a last minute socially distanced field day. Manitoba had a small event showing the French Fry selections to the processors and another day in conjunction with the Peak of the Market Field Day showcasing all the selections in the NPVT. Quebec did not have a field day, but opted to invite a few local industry members to see the selections. The field days are an important part of showcasing the selections to industry.

A presentation entitled “Better Varieties Faster: In Partnership with Industry and Growers” was given at the Potato Summit organized by Potatoes in Canada on Feb 2, 2022 to describe the changes made to the Potato Breeding Program as well as the NPVT and some of the newly licensed varieties. Another presentation entitled “National Potato Variety Trials: Moving Towards the Next Cluster” was given at the Potato Breeding Stakeholder Engagement Session on Feb 22, 2022.

COVID-19 Related Challenges:

As mentioned above, one of the key COVID-19 related challenges has been scheduling and holding field days. Many sites were reticent to schedule field days before they knew what the impacts were of the fourth wave or what the provincial requirements would be for gatherings and/or proof of vaccination. In addition, the pandemic prevented AAFC sites from having a field day to get industry feedback on the pre-National Trial and NPVT selections. Some sites also had some COVID related labour issues that caused some delays in data collecting at harvest and/or grading. However, all sites were planted, harvested and were graded with the appropriate data collected.

Key Message(s):

These trials are important for industry stakeholders to observe selections and review regional data for promising new varieties. The value-chain nature of the trial and efforts to provide data as required for each stakeholder will result in the uptake of new varieties for the Canadian potato industry. Specifically, for French Fry selections, one request was made for F14021, four requests for VF14016, and five requests for VF140855-07 and VF140855-11 by industry partners, based on their success over multiple locations and/or their own experience trialing the material in 2020 & 2021. The Fresh Market selection, F14119 and the Chip selection, FV16324-08, were requested by 2 industry partners for further

trialing. In addition, 9 sole variety license agreements have been signed for new varieties from the Accelerated Release Program.

The AAFC National Potato Breeding Program is focusing its efforts to work in unison with all stakeholders to increase the value of the program and to make the new commercialization model relevant to the various market classes of the Canadian Potato Industry.

This project under the Canadian AgriScience Cluster for Horticulture 3 is funded in part by the Government of Canada through the Canadian Agricultural Partnership's AgriScience Program, a federal, provincial, territorial initiative, with support from the Fruit and Vegetable Growers of Canada (formerly the Canadian Horticultural Council) and industry contributors.

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Canadian Agri-Science Cluster for Horticulture 3

Update to Industry

Semi-Annual – Spring 2022

Activity title:
Canadian Potato Variety Evaluation **16B** (Manitoba Fresh Market)

Name of Lead Researcher:
Dr. Tracy Shinners-Carnelley, Peak of the Market Ltd.

Activity Objectives (as per approved workplan):
The objective of this research was to evaluate the yield and quality parameters of red-skinned/white flesh, yellow, white, russet, and creamer potato varieties and assess their potential as fresh market varieties for Manitoba.

Research Progress to Date (use plain language, not to exceed 500 words):
In 2021, 45 potato varieties were evaluated at the Peak of the Market Research Site located in Winker Manitoba. The trial included red-skinned/ white flesh, yellow, white, russet, and creamer types, as well as the industry standards. The trial was established and managed by type i.e. reds, yellows, creamers, and where possible agronomic practices were suited to the type of variety. Specifically, the in-row plant spacing, fertility, top-killing, and harvest dates were managed for each type. One limitation for the 2021 was access to water for irrigation. Although the site is irrigated, the water source was depleted by July 9, so the varieties experienced extreme heat and dry soil conditions for much of the bulking period. The trial received a total of 2.5" of irrigation that was applied between June 24 and July 9. This supplemented the rainfall of 7.9" received from planting (May 18) through until top killing (September 3), for a total of 10.4" of water.

The varieties evaluated in this trial were provided by private breeders, Agriculture and Agri Food Canada, breeder's Canadian agents, and variety developers. The gross yield produced by the 21 red varieties ranged from 311 cwt/ac – 658 cwt/ac, with seven of the entries yielding over 500 cwt/ac. The standards Dark Red Norland and Wisconsin Norland yielded 559 and 485 cwt/ac, respectively. Fenway Red, at 658 cwt/ ac, was the only red entry that had a gross yield significantly higher than the standards. Cristina, Red Endeavor, AR2017-08, Roko, and Red Prairie all produced gross yields comparable to Dark Red Norland. Russeting and silver patch continue to be the most prevalent defects on the red varieties, with incidence ranging from 0-68% for russeting and 0-72% for silver patch. Silver patch has not yet been described in the scientific literature, but it is a skin blemish that is silvery in appearance but does not form distinct lesions like silver scurf or black dot. The cause of silver patch is unknown, and to date, no pathogens have been isolated from affected tubers. In multiple years of variety evaluation, dark Red Norland sports (phenotypic variants) of Red Norland consistently have the highest incidence of this defect, and this was the result again in 2021.

The 10 yellow varieties evaluated yielded between 450 cwt/ac – 593 cwt/ac, with the industry standard, Musica, yielding the highest. AC Canada Gold also yielded well at 553 cwt/ac and was not significantly different than Musica. Musica, Colomba, and Constance were the most attractive entries; while skinning and black scurf were the prominent defects observed on some of the yellows. Overall, the yield in this category was lower than it has been in previous years of the trial, and this is attributed to the extreme heat and drought experienced in Manitoba in 2021. In particular, Alaska Gold suffered from heat stress and produced deformed tubers and heat runners.

The five russet varieties evaluated yielded between 327 cwt/ac – 437 cwt/ac, with the top performer being Innovator (437 cwt/ac) which was significantly higher yielding than the industry standard, Goldrush (394 cwt/ac). These varieties also had an attractive appearance suitable for the fresh market. Pomerelle was included in the trial because it has been identified as a "dual" purpose variety, however, tubers produced in 2021 were very long, making it unsuitable as a fresh pack variety.

Eight white varieties were evaluated in the 2021 trial. The yields in this category ranged from 216 cwt/ac – 659 cwt/ac. Audrey (659 cwt/ ac) and Volare (634 cwt/ac) had significantly higher yields than the other white entries. Skinning, russeting, and black scurf were the common defects noted on the whites after washing.

AAC Red Viola was the only creamer included in the trial this year. It is a very attractive round creamer with a smooth dark red skin. Although the total yield was 225 cwt/ ac, the agronomics in this trial where not designed to maximize the yield for creamer production, and this should be considered when reviewing the performance of this variety.

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

The 2021 variety entries were highlighted during the Peak of the Market field day on August 12, 2021. Also, the final report was presented on February 1, 2022, as part of the Peak of the Market Research Reporting Virtual Winter meeting series.

COVID-19 Related Challenges:

COVID-19 did not impact the field trial activities of this project. The report was delivered virtually, and although the data was reported and photographs shared, there was no in-person opportunity to showcase washed samples from the trial.

Key Message(s):

Growers are very interested in evaluating and identifying new varieties that have improved yield, quality, or other agronomic or nutritional attributes compared to the current industry standard varieties. Trials like this allow for efficient evaluation and comparison of many varieties from different breeders or developers and help to increase the likelihood of identifying varieties with potential for production in Manitoba. In a stressful year like 2021, this trial also provides knowledge of varieties that perform well, with respect to both yield and quality, under extreme heat and drought conditions.

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Canadian Agri-Science Cluster for Horticulture 3

Update to Industry

Semi-Annual – Spring 2022

Activity title: Evaluation of potato selections and varieties for central Canada

Name of Lead Researcher: Dr. K. S. Jordan and Dr. J. A. Sullivan

Names of Collaborators and Institutions:
University of Guelph, Ontario Potato Board, Stuart Cairns Potato Research Committee (through CHC)

Activity Objectives

1. Identify and evaluate processing potato selections with long term storage potential.
2. Identify and evaluate tablestock lines for value added traits such as early maturity, coloured skin and flesh, and specialty market potential.
3. Identify and evaluate very early maturing selections for use by the processing industry.
4. Evaluate elite selections for tolerance to scab (*Streptomyces scabies*)

Research Progress to Date

Field trials were conducted in Ontario to evaluate potential new selections for the potato industry. Early generation material developed by AAFC Fredericton was selected for adaptability in Ontario. The selections are then maintained in the AAFC system for further testing. Our evaluations include a comprehensive measurement of agronomic traits such as vine vigour, maturity, yield, appearance of tubers. Culinary quality is evaluated through boiling and baking tests. Samples of the lines with chip potential are stored is a commercial storage and evaluated for quality characteristics. Trials were conducted for processing (ie. chips), table stock and specialty markets.

Early Maturing Chip Trial

Seven lines with early maturity were grown in a replicated trial at C. J. Bradley Farms in Leamington Ontario. Plots were harvested after 86 days from planting and evaluated for yield and chip quality. Promising results were obtained in two of the lines and further evaluation will be conducted.

AAFC trials- National and Advanced selection

Approximately 25 elite breeding lines were grown in replicated plots at the Elora Research Station. Selections have potential for fresh market, chip processing, creamers and specialty (health) markets. Data was collected on plant vigour, maturity, yield and tuber quality. Samples from lines with chip processing potential are stored in a commercial facility and will be evaluated monthly throughout the storage season for specific gravity, chip colour, and sucrose and dextrose measurements.

Main Crop Chip Trial

Approximately 10 promising chip lines were obtained through collaborations with other breeding programs including the University of Wisconsin and Michigan State University. Replicated field trials were grown at the Elora Research Station. Data were collected on yield and chip processing quality at harvest. Samples are stored in a commercial facility and have been evaluated monthly for specific gravity, chip colour, sucrose and dextrose. Samples stored at 4°C and 8°C for five months were also evaluated.

Main Crop Tablestock Trial

Approximately 6 promising fresh market selections plus standards were obtained through collaborations with other breeding programs, including the University of Wisconsin and Michigan State University. Replicated plots were grown at the Elora Research Station. Data were collected on agronomic characteristics (ie. maturity, yield, tuber appearance) and culinary quality (ie. specific gravity, boiling, baking,)

Early Generation Selection of Breeding Lines

Approximately 180 selections with potential for fresh market and chip processing sectors were grown in 4 hill plots at the Elora Research Station. Eight lines were selected and will be advanced through the system. By selecting earlier generations in Ontario there will be a significant increase in the probability of identifying lines which are adapted for central Canada. This will also be an important tool towards adapting to climate change.

On-farm Trials

These trials were conducted in collaboration with the Ontario Potato Board and Dr. Eugenia Banks. Promising new varieties and advanced selections from breeding programs were evaluated in non-replicated plots in commercial fields in the Alliston and Hamilton areas. Scab tolerance was evaluated in the on-farm trials in 2021.

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

1. August 11, 2021. *Potato Research Open House*. Elora Research Station. Thirty-five visitors toured the potato trial demonstration. University of Guelph researchers were present to discuss the variety trials, the CanPED network, CPB options and potato starch.
2. October 27, 2021. Ontario Potato Board District 1 meeting. Leamington, ON. Vanessa Currie presented research highlights from the season to growers in the Leamington area.
3. November 2, 2021. Potato Board District 4 meeting. Shelburne, ON. Vanessa Currie presented research highlights from the season to growers in the Shelburne area.
4. November 3, 2021. Potato Board District 7 meeting (virtual). Vanessa Currie presented research highlights from the season to growers in Northern Ontario.
5. November 12, 2021. Ontario Potato Board District 2 meeting (virtual). Vanessa Currie presented research highlights from the season to growers in the Grand Bend area.
6. November 16, 2021 Potato Board District 7 meeting (virtual). Vanessa Currie presented research highlights from the season to growers in the Alliston area.
7. November 17, 201. Stuart Cairns Potato Research Committee. *Evaluation of New Chipping Potato Varieties*. (virtual) Vanessa Currie presented results to the committee along with a 29-page report.
8. December 1, 2021. Ontario Potato Board AGM. Guelph, ON. Vanessa Currie and Katerina Jordan presented a full report to the members of the Ontario Potato Board. January 19, 2022. Tuber Talk. Potatoes in Canada podcast. https://www.potatoesincanada.com/podcasts/updates-from-the-university-of-guelphs-breeding-program/
9. February 16, 2022. Ontario Seed Potato Growers Association meeting (virtual).
10. February 22, 2022. AAFC Potato Breeding Stakeholder Engagement Session. Vanessa Currie participated virtually.

COVID-19 Related Challenges:

The COVID-19 pandemic continued to create challenges for researchers in 2021. Much of the province was in lockdown during April and May, but essential research at the University of Guelph was permitted to continue only with approved research management plans. The potato research program met all the requirements to continue operating and team members were extremely vigilant. The overall size of the trials was reduced, as it had been in 2020. Fortunately, the early maturing chip trial, which had been cancelled in 2020, was resumed successfully. By August, many local restrictions had been lifted and we welcomed visitors in person to our field open house in Elora. Throughout the fall, some industry meetings were held in person and some were virtual. Storage testing was conducted as planned. Our research continued smoothly due to careful compliance with safety procedures and high vaccination rates. The level of cooperation and support from all team members and our cooperators has been exemplary.

Key Message(s):

The need to produce a continuous supply of high quality potatoes is an ongoing challenge to Canadian potato growers. Producers require varieties which generate profitable yields under sustainable production systems. This dynamic situation creates a requirement for a steady stream of new, value-added varieties. In 2021, over 100 advanced selections and new varieties from the AAFC National Potato Breeding program and other breeding programs were evaluated. We made selections from early generation breeding lines to determine adaptability to Ontario conditions. Storage quality tests are ongoing throughout the winter. On-farm trials and scab evaluations were conducted in commercial fields. Results from the trials are reported to the Ontario Potato Board through the annual reports and industry meetings. The potato industry will have access to new, high quality varieties along with current performance data from multiple field sites.

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