2021 Southern BC Potato Research Priorities

Final report to:
BC Potato and Vegetable Growers Association

Prepared by:
Marjolaine Dessureault and Megan Gray
E.S. Cropconsult Ltd.

November 9, 2021

Executive Summary

Potato growers from the Fraser Valley and the Pemberton Valley in British Columbia (BC) were asked to select and rate the top four issues that they deemed most important for their operation and the southern BC potato industry. Growers were interviewed from October 1 to October 31, 2021 after the 2021 harvest season. A total of 25 survey responses (17 from conventional growers and eight from organic growers) were returned for a percentage response rate of 74%. For the conventional industry, heat stress/climate change ranked in first place, fertility/nutrient management and storage rot/tuber rot diseases equally ranked in second and third places and salt issues/soil health ranked in fourth place. Organic growers ranked silver scurf in first place, wireworm in second place, fertility/cover crop ranked in third place and rhizoctonia (black scurf) and weed control equally ranked in fourth place. The southern BC potato industry is facing both recurring and season-specific issues. Research and outreach should focus on addressing recurring issues and new or emerging issues identified through the 2021 survey.

Introduction

Potatoes are an important cash crop in British Columbia (BC) with about 6,000 acres in production (BCGOV 2018). The production is mostly conventional with both table and seed potatoes being grown, although organic potatoes are also part of the BC potato landscape. Potato production is constantly evolving to follow market trends, manage pests on the rise, and adapt to climate change. The potato industry is facing a number of issues including diseases (e.g. late blight, seed piece decay, storage rot), insects (e.g. wireworms, tuber flea beetles, aphids) and abiotic factors (e.g. hollow heart, enlarged lenticels, cracks) (AAFC 2017).

Over the last seven years of the southern BC potato industry surveys, late blight, wireworm, and storage rot have often made the top four issues. Others such as climate change, fertility and product registration/de-registration have come up only in the recent years of this survey, reflecting the new and emerging issues for the potato industry (Dessureault *et al.* 2020). It appears to be crucial to survey growers yearly to capture the changes in concerns and identify issues that growers are continuing to face. The creation of a research priority list helps potato growers and researchers to focus on main issues of concern and encourages collaboration, allowing the BC potato industry to be more competitive.

Objective

The objective of this work is to identify the 2021 research priorities for the southern BC potato industry.

Methodology

Potato growers from the Fraser Valley and the Pemberton Valley were contacted via in-person visits, email or phone between October 1 and October 31, 2021. A total of 34 growers were contacted. The interviewees were asked to select and rate the top four issues that they deemed most important for their operation and the southern BC Potato Industry. The interviewees could either select issues listed in Table 1 or add additional issues and comments. Some issues were

pooled together when they were interlinked in the way that growers answered. In each survey, the first issue (of most importance) was allocated 40 points, the second issue 30 points, the third issue 20 points and the fourth issue (of least importance) 10 points. The research priorities along with comments were summarised.

Table 1. List of potential issues provided to the growers. Growers were not restricted to this list and could add additional issues, if required.

Category	***Issue***	
Diseases	• Black dot • Common scab • Damping off • Fusarium (dry rot) • Late blight • Pink rot • PVY (mosaic virus)	• Pythium leak • Rhizoctonia (black scurf) • Silver scurf • Soft rot • Storage rot/tuber disease (general) • Verticillium wilt
Insects/Mites	• Aphids • Cutworms • Thrips • Loopers	• Lygus • Tuber flea beetles • Two-spotted spider mites • Wireworms
Others	• Alternative crops • Black heart • Bruising • Cover crops • Crop rotations • Desiccation • Disinfection of equipment • Fertility • Growth cracks • Handling of seed • Irrigation • Lenticel issues	• Product registration/de-registration • Russeting • Salt issues • Skin colour • Skin set • Soil health • Spacing/tuber set • Storage conditions • Tuber appearance • Weather/climate change • Weed control • Yield

Results and Discussion

A total of 25 survey responses were returned for a percentage response rate of 74%. Conventional growers represented 68% of the responses and organic growers 32%. The results for the conventional and organic industries were compiled separately. The issues that ranked the highest in 2021 were:

Conventional	**Organic**
1 – Heat stress/climate change (340 points) **2/3 – Fertility/nutrient management & storage rot/tuber rot diseases (**120 points each) **4 – Salt issues/soil health** (110 points)	**1 – Silver scurf** (140 points) **2 – Wireworm** (100 points) **3 – Fertility/cover crop** (80 points) **4 – Rhizoctonia (black scurf) & weed control** (70 points each)

Conventional

Heat stress/climate change came up as the first issue of concern for the conventional potato industry this year (Table 2). This is not surprising as the 2021 growing season in most of British Columbia was characterized by above average temperatures. The crop was under heat stress for most of the season, starting at the end of June when the province was hit by the first heat wave. As a result of high temperatures and dry conditions, growers had to deal with a number of issues including poor emergence, compromised growth, increased pest pressure, reduced yield, and poor quality of tubers. Most growers significantly increased their irrigation output with some growers seeing the benefits and others wondering if it changed the agronomic performance of their crop or not. Growers want to have more information on ways to mitigate the effect of climate change including information on timing, frequency, and rate of irrigation. Several growers mentioned that variety selection should also be a focus to adapt to climate change. Harvest was also challenging due to precipitation in September, an effect of climate change that growers are increasingly worried about. As a result, working on solving drainage issues will become increasingly important to better manage wet springs and falls. It was mentioned that field specific information, including "mapping" of fields, will become more valuable to better respond to heat stress and excess water at harvest. Climate change also made the top-four in 2019 (Appendix A) and is likely to be at the forefront on growers' concern in future years.

Fertility/nutrient management ranked in second/third places along with storage rot/tuber rot diseases. Fertility also made the top-four in 2019 and 2020. Growers would like more information and support to make decision on fertility regimes that are field specific and adapted for the varieties that they grow. As growers become more aware of the requirements for post-harvest soil nutrient testing under the Agricultural Environmental Management Code of Practice (AEM Code) (BCGOV 2019), they would like more support to determine the right rate and timing to avoid leaving excess nutrients in the soil. Storage rot/tuber diseases is not a new concern. It comes up almost every year in the top four, with pythium and soft rot as the main rot diseases of concern. With harvest conditions getting more challenging due to climate change, potatoes are harvested in sub-optimal conditions, leading to rot issues in storage.

Salt issues/soil health came in fourth place. This ranking was mostly driven by responses from growers in the Delta region, where salt issues have been affecting crops in some fields/areas of

fields, especially during hot and dry summers. Salt issues was mentioned in previous years, but it is its first time in the top-four. Soil health however, made the top-four in 2015.

Table 2. Cumulative points of each issue and interviewee comments based on 17 responses collected from conventional growers during the 2021 southern BC potato research priorities survey.

Cumulative points	***Issue***
340	**Heat stress/climate change**
Comments: • Growers are increasingly dealing with extreme conditions from flooding risk to heat stress, need mitigation for both. • Yield and quality (tuber appearance, colour, and shape) was affected by the heat wave on a high number of farms. • Does irrigating in the heat make a difference? • Need more information on timing, frequency, and rate of irrigation. • Should growers irrigate before emergence during a hot and dry period? • What are the drawbacks of increased irrigation? • What is the plant response to irrigation? • Should we plant deeper to reduce heat stress? • Variety selection to deal with heat stress will become increasingly important. • Need more field specific information to deal with the extreme conditions to optimise irrigation resource and deal with drainage issues and flooding risk in fields.	
120	**Fertility/nutrient management**
Comments: • Timing of fertilizer applications for best growth and yield. • With new requirements for post-harvest soil nutrient testing (AEM Code), it would be valuable to establish baseline fertility regime to produce a good potato crop without leaving excess amounts of nutrients in the ground. • What are the right rates for each field and for each variety? • Would like more information and support to make decision on fertility regime based on science and data.	
120	**Storage rot/tuber rot diseases**
Comments: • Growers' concerns include pythium, soft rot on tubers, aerial soft rot on stems leading to tuber soft rot, and pink rot.	
110	**Salt issues/soil health**
Comments: • Addressing salt issues in Delta. Salt issues are worsened during hot and dry years: when there is a salt issue, the plants do worse with other stressors.	
90	**Cutworms**
Comments: • Are there any varietal differences in susceptibility to cutworm infestations? • Need to work on timing of insecticide spray.	
90	**Late blight**

Comments:

- Need to look at chemistry replacement

80	**Crop rotation/cover crop**

- Best cover crops for a short potato rotation.
- Cover crop options for improved root mass and soil health.
- What to plant before potatoes to minimize pest issues.
- What is the best rotation to support a good potato crop.

70	**Weed control**

- Different weeds are becoming an issue with climate change with some (e.g. barnyard grass) seemingly becoming harder to control.
- Yellow nutsedge is spreading with no effective spray options.
- Worried about resistance management with repeatedly using the same herbicides and equally worried about de-registration of products.
- The BC production guide lists the products registered but would also like information on how to effectively use these products and their efficacy on different weeds.
- A local herbicide trial would be valuable.

60	**Wireworms**

Comments:
N/A

50	**Product registration/de-registration**

Comments:
N/A

40	**Top-killing/skin set**

Comments:

- How many days to leave potatoes in the ground after top-kill? Other regions can do 35 days but this is difficult in the Fraser Valley due to weather constraints.
- Red varieties start re-growing after top-kill, which affects skin set.

40	**Variety selection**

Comments:

- Keeping on top of variety selection in BC will be very important to manage the heat better.
- Need multiple years of data before adopting a new variety as there are variabilities from year to year.

40	**Tuber flea beetles**

Comments:
N/A

30	**Two-spotted spider mites**

Comments:

- Increased pest pressure due to climate change

30	**Phytoplasma/leafhoppers**

Comments:

- Will this be an increasing issue with climate change?

30	**Powdery scab**

Comments:

N/A

30	**Handling of seed before planting**

Comments:

- Performance of small vs. big seed pieces. Effect of seed piece cutting and size on yield and other agronomic parameters.

30	**Fusarium (dry rot)**

Comments:
N/A

20	**Seed piece treatment**

Comments:

- The industry lost most of the dry seed piece treatments. Need to look at what methods are most effective to protect and dry the seed pieces.

20	**Thrips**

Comments:

- Increased pest pressure due to climate change.

20	**Aphids**

Comments:

- Aphid management in seed potatoes.

20	**Rhizoctonia (black scurf)**

Comments:
N/A

20	**Nematode**

Comments:

- How to manage nematodes?
- Is Vapam effective?
- Are biofumigants such as white mustard effective?

20	**Common scab**

Comments:
N/A

10	**Growth cracks**

Comments:
N/A

Organic

Silver scurf ranked as the top concern for organic growers (Table 3). It is the first time that this disease makes the top-four (Appendix A). Organic growers find this disease hard to manage with limited control options and storage facility not suitable for optimal disease control.

Wireworms ranked in second place for the organic industry. Wireworms make the organic top-four most years. Management options under an organic regime are limited for wireworms. Organic growers would like to see work being done using cover crops as a wireworm management tool.

Fertility/cover crop ranked in third place. Growers would like more work done or more information provided on organic fertilizer options, including micronutrient amendments. They would like more information on cover cropping to increase organic matter in the soil, improve soil moisture retention, and aid in pest management. Fertility also made the organic top-four in 2020.

Rhizoctonia ranked in fourth place along with weed control. Rhizoctonia is a recurring issue for the organic industry due to, again, very limited management options available. Weed control made the top-four for the first time this year, both conventional and organic growers reported that weed pressure was high in the summer of 2021. Organic growers need organic weed control options once it is no longer possible to cultivate potatoes (after hilling). Continuing the discussion and knowledge sharing around tools and techniques for mechanical weed control was also reported to be important for organic growers.

Table 3. Cumulative points of each issue and interviewee comments based on eight responses collected from organic growers during the 2021 southern BC potato research priorities survey.

Cumulative points	***Issue***
140	**Silver scurf**
Comments: • Organic management options needed. • Storage facilities are not always suited to manage this disease but what could growers do to make them better without investing a lot of money. • How to make post-harvest treatments more feasible to use?	
100	**Wireworms**
Comments: • Looking at cover crops (e.g. mustard and buckwheat) for wireworm management. • Wireworms also affect a number of other crops that potato growers might also grow (e.g. carrots).	
80	**Fertility/cover crop**
Comments: • Fertility program to match conventional yield. • Bioactive and organic micronutrient amendments. • Utility of high nitrogen fertilizer in organic production. • Organic fertilizer options. • Ways to build organic matter in the soil. • Cover cropping to build organic matter in the soil. • Cover crop incorporation/cultivation techniques and timing. • Building up organic matter for moisture retention.	
70	**Rhizoctonia (black scurf)**
Comments: N/A	
70	**Weed control**
Comments: • High weed pressure during the 2021 growing season.	

- Weeds reduce yield and increase humidity in the canopy, increasing late blight risk.
- Need organic weed control options once it is no longer possible to cultivate, especially after hilling.
- Tools and techniques for mechanical weed control (continued discussion and knowledge sharing).

50	**Late blight**

Comments:

- Copper fungicide comparison (e.g., Parasol versus Cueva).
- Concerns around the use of copper and its build-up in the environment.
- Buffer requirement between area sprayed with copper and watercourse is hard to meet.
- Need to diversify management options and work on products other than copper.
- Work on copper formulations that are more environmental.
- Work on resistant varieties.

40	**Common scab**

Comments:
N/A

40	**Tuber flea beetles**

Comments:

- How effective is Entrust?
- Need a rotational product to use with Entrust to avoid resistance build-up.
- Cover cropping and cultivation to disturb lifecycle and eggs laid in the ground.

40	**Storage rot/tuber rot diseases**

Comments:

- Management of pythium leak.
- Harvest has become unpredictable with climate change and requires growers to harvest earlier or under conditions that are not optimal to prevent bruising and disease development.
- Methods to reduce mechanical damage at harvest, especially for smaller scale operations.

30	**Black dot**

Comments:

- Organic management options needed.

30	**Irrigation**

Comments:
N/A

30	**Climate change/heat stress**

Comments:

- Effect of heat on potato yield. Putting stress on farmers/workers to work in the heat.

20	**Top-killing/skin set**

Comments:

- Water-applied product would be feasible for growers to use (with current equipment) post mowing.

20	**Variety selection**

Comments:

- Continued work on variety selection is important, especially for organic producers.
- Varieties that do well for long-term storage are needed (all the way to May).

10	**Verticillium wilt**

Comments:

- Interested in learning about management options.
- Are there management options other than long rotations?

10	**Handling of seed before planting**

Comments:
N/A

Conclusion

The southern British Columbia (BC) potato industry is facing both recurring and season-specific issues. For the conventional industry, late blight and storage rot are examples of recurring issues, whereas climate change and fertility have made the top-four in more recent years. For the organic industry, rhizoctonia (black scurf), wireworms, tuber flea beetles, and late blight are at the forefront of growers' concerns in most years, but this industry had two new entries this year with silver scurf and weed control. Research and outreach should focus on addressing recurring issues and new or emerging issues identified through the 2021 survey.

Acknowledgements

Thank you to the participating growers. Thank you to the BC Potato and Vegetable Growers Association for providing funding.

Funding was provided in part by the BC Potato and Vegetable Growers' Association and the Canadian Agricultural Partnership, a five-year, $3 billion investment by federal, provincial and territorial governments to strengthen the agriculture, agriculture, agri-food and agri-based products sector, ensuring continued innovation, growth and prosperity.

Opinions expressed in this document are those of the author and not necessarily those of Agriculture and Agri-Food Canada or the BC Ministry of Agriculture. The Government of Canada, the BC Ministry of Agriculture and their director's agents, employees or contractors will not be liable for any claims, damages or losses of any kind whatsoever arising out of the use of, or reliance upon, this information.

References

(AAFC) Agriculture and Agri-Food Canada, Pest Management Program. 2017. Crop Profile for Potatoes in Canada, 2017. Accessed from: http://publications.gc.ca/collections/collection_2019/aac-aafc/A118-10-22-2017-eng.pdf.

(BCGOV) Government of British Columbia. 2018. Fast Stats 2017. British Columbia's Agrifood and Seafood Sector. Accessed from: https://www2.gov.bc.ca/assets/gov/farming-natural-

resources-and-industry/agriculture-and-seafood/statistics/industry-and-sector-profiles/fast-stats/faststatsbc_2017.pdf

(BCGOV) Government of British Columbia. 2019. Code of Practice for Agricultural Environmental Management (AEM Code), Environmental Management Act. Accessed from: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/8_2019

Dessureault, M., Gray, M., Benn, A., Meberg, H., Yates, D., Ma, K. 2020. Southern BC Potato Research Priorities 2020. Delivered to BC Potato and Vegetable Growers Association.

Appendix A. *Top issues ranked in previous years (2014 to 2020) by conventional and organic growers for the southern BC potato research priorities survey.*

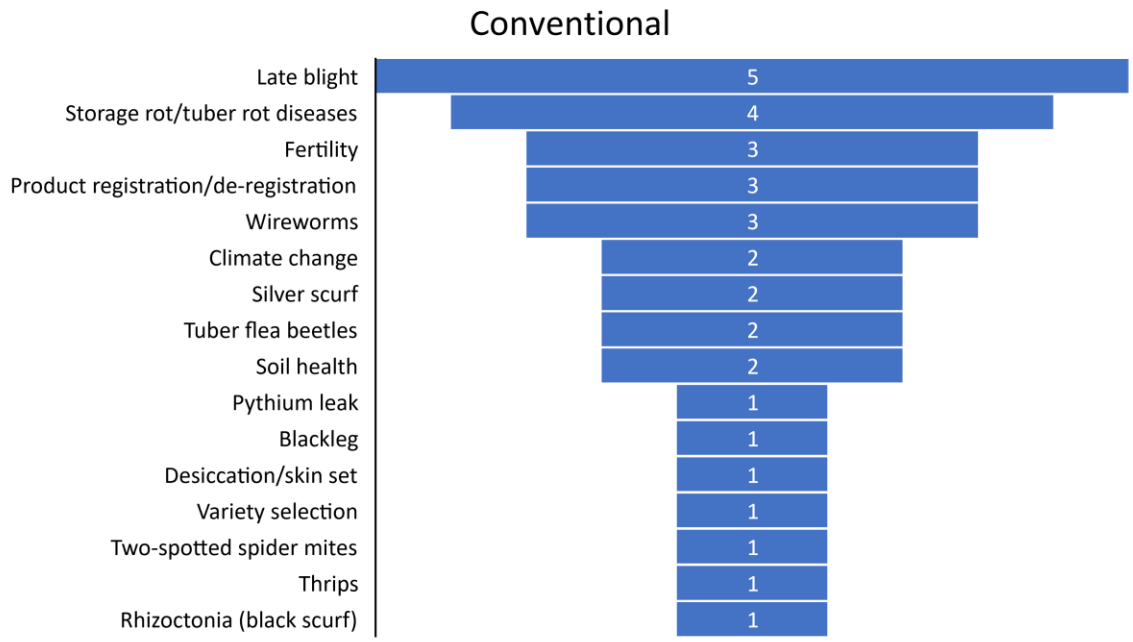

Figure A1. Summary of issues listed in the conventional potato top-four from 2014 to 2020 with frequency of appearance indicated by the white number on the bars.

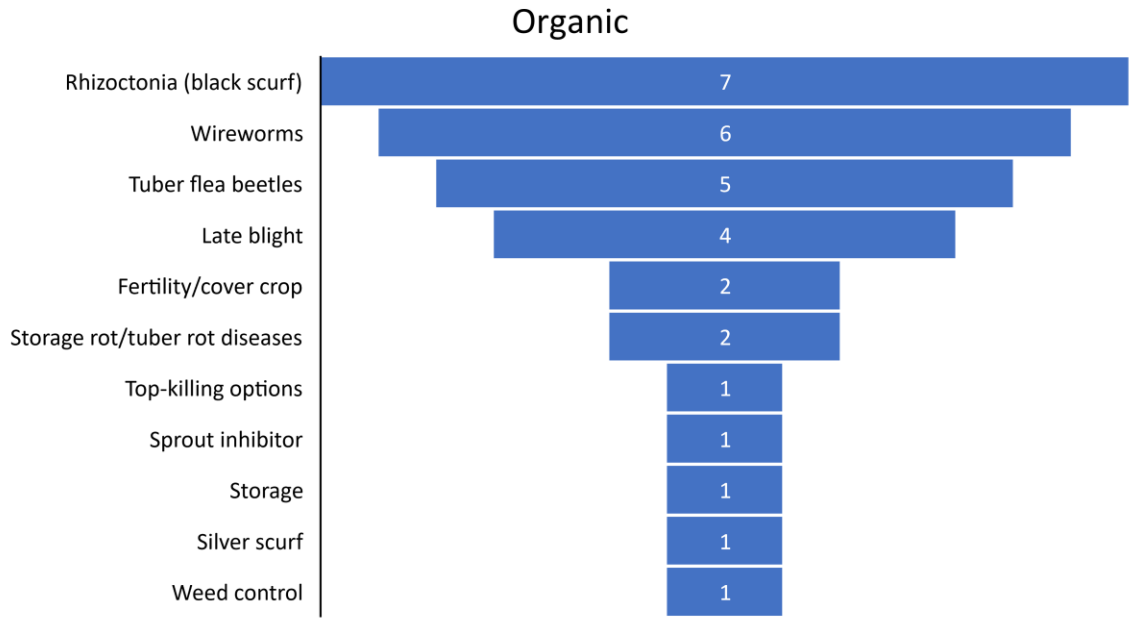

Figure A2. Summary of issues listed in the organic potato top-four from 2014 to 2020 with frequency of appearance indicated by the white number on the bars.

Table A1. Summary of issues listed in the conventional and organic potato top-four from 2014 to 2020.

Year	*Conventional*	*Organic*
2020	**1- Late blight** (240 points) **2- Fertility/yield/sizing** (180 points) **3/4- Product registration/de-registration and storage rot** (170 points each)	**1- Wireworms** (160 points) **2- Rhizoctonia (black scurf)** (90 points) **3/4- Late blight and Fertility/yield** (70 points each)
2019	**1- Product registration/de-registration** (180 points) **2- Weather/climate change** (170 points) **3- Wireworms** (140 points) **4- Fertility/yield/sizing** (120 points)	**1- Wireworms** (220 points) **2- Tuber flea beetles** (100 points) **3- Rhizoctonia (black scurf)** (90 points) **4- Storage rot/tuber disease/storage conditions** (70 points)
2018	**1- Product registration/de-registration/neonicotinoids** (210 points) **2- Pythium leak** (160 points) **3- Blackleg** (110 points) **4- Silver scurf** (100 points)	**1- Rhizoctonia** (80 points) **2- Tuber flea beetles** (70 points) **3- Top-killing options** (40 points)
2017	**1- Late blight** (130 points) **2- Desiccation and skin set** (80 points) **3- Silver scurf** (70 points) **4- Wireworms** (60 points) **5- Storage rot/tuber disease** (60 points)	**1- Rhizoctonia** (120 points) **2- Wireworms** (90 points) **3- Late blight** (70 points) **4- Tuber flea beetles** (50 points)
2016	**1- Storage rot/tuber disease** (280 points) **2- Late blight** (165 points) **3- Variety selection** (140 points each) **4- Two-spotted spider mites** (120 points)	**1/2- Late blight and sprout inhibitor** (100 points each) **3/4- Tuber flea beetles and wireworms** (70 points each)
2015	**1- Late blight** (280 points) **2- Tuber flea beetles** (130 points) **3/ 4- Soil health and thrips** (100 points each)	**1- Late blight** (80 points) **2- Disease development in storage** (70 points) **3/4- Rhizoctonia and cool storage** (40 points each)
2014	**1- Late blight** (220 points) **2/ 3- Tuber flea beetles and rhizoctonia (black scurf)** (200 points each) **4- Wireworms** (190 points)	**1- Late blight** (220 points) **2/3- Tuber flea beetles and rhizoctonia (black scurf)** (200 points each) **4- Wireworms** (190 points)