

# 2015 - 2016 Research Highlights

## for Projects Supported by Prince Edward Island Potato Growers



In early 2013, Prince Edward Island potato growers overwhelmingly supported the expenditure of levy dollars to support provincial and national potato research that addresses the research priorities which Island potato growers helped to establish in recent years. Funding from the PEI Potato Board, combined with funds from other industry partners, leveraged over \$1.6 million in both provincial and national research spending in the 2014/2015 fiscal year.

Reports on the following pages outline some of the key results from completed and ongoing research projects that received support from the PEI Potato Board in the last year. These projects were primarily conducted here in Prince Edward Island in cooperation with a variety of research partners.

The Board has also committed significant funds (approximately \$21,000 per year) to the National Potato Research Cluster Project administered by the Canadian Horticultural Council (CHC) under the federal Growing Forward II program. As part of this cluster, PEI potato growers are supporting research into wireworm, variety evaluation, PVY, and *Verticillium* testing. Interim results in each of these research areas are reviewed here, and full reports on these projects are available on the Canadian Horticultural Council's website.

The Board committed approximately \$65,000 toward research projects and research coordination for the 2015-2016 financial year. This amount is projected to increase to approximately \$78,000 in 2016/2017, due to the approval of some new projects, both local and national. The Board's Research and Environment Committee will continue to review proposed research to determine whether it addresses the priorities of Island potato growers. The Committee welcomes expressions of interest from potato researchers looking for financial support or assistance in coordination for upcoming projects.

New projects in 2015/2016 included a variety trial focused on starch production as well as soil health and erosion prevention research as part of an Agri-Innovation Project with Potatoes New Brunswick and Agriculture & Agri-Food Canada. Newly approved to start in 2016/2017 is another Agri-Innovation Project investigating late blight, as well as a multi-partner collaboration with Dalhousie Faculty of Agriculture to investigate an RNA interference (RNAi) approach to wireworm control.

In addition, processing growers selling to Cavendish Farms, in cooperation with the PEI Potato Board, Cavendish Farms and the Province of Prince Edward Island, are partnering to support the Enhanced Agronomy Initiative. This initiative will be a grower-driven effort to improve marketable yields and profitability for Prince Edward Island processing growers. As part of this initiative, some small-scale research trials will undoubtedly be conducted with growers across the province. Stay tuned for more details on these research efforts and other research collaborations.

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### *Major Research Coordination and Funding Partners:*



# WIREWORM

## CHC Cluster Project: Wireworm Activity

Research conducted by Dr. Christine Noronha (AAFC), Dr. Robert Vernon (AAFC), Dr. Ian Scott (AAFC) and Todd Kabaluk (AAFC). Research taking place in PEI and BC.

**Research Purpose:** A multi-faceted approach to identify tools which potato growers can use to reduce the impact of wireworm on their crops.

### Key Findings:

#### Insecticide efficacy trials

- Products were tested in both British Columbia and PEI for tuber blemishes in fields heavily infested with wireworm.
- Both Thimet and Capture were evaluated and showed similar levels of control. Both insecticides were also tested in laboratory conditions to assess their affect on wireworm. Thimet appears to actually kill wireworms, while Capture has a paralyzing effect on wireworms.
- Additional insecticides were tested, including some experimental products. Some of these proprietary products gave promising results and will continue to be evaluated in future years.

#### Wheat seed-treatment trials:

- Wheat seed-treatment trials were completed in BC, Alberta and PEI using a number of new proprietary products which look promising. Products are being assessed for both lethal and non-lethal effects on wireworms.
- Field spray trials to kill click beetles were also conducted on grassland in BC and PEI. Use of Matador 120EC provided 52% kill rate on *Agriotes sputator*. Additional work to be conducted in 2016.

#### Evaluation of brown mustard for bio-control:

- Trial performed in PEI using mustard as a nurse crop. Results showed that brown mustard planted between the rows have significant reduction in tuber damage. Further study require to refine this strategy.
- Trials in grower fields were also performed. Results from one trial showed a significant decrease in damage regardless of whether a brown mustard crop was clipped through the growing season,



incorporated mid-season, or harvested for seed compared to the barley check.

#### Evaluation of *Metarhizium* for bio-control:

- Pheromone granules were created to develop an “attract and kill” control program for click beetles using *Metarhizium* fungal spores. Additional work was done to weather proof the granules, as well as measuring lowest effective rates to minimize cost. Additionally, oil emulsion formulations of spores were developed, setting the stage for trials to spray fields to control click beetles. Minor use registration for the Met52 product has been initiated, and additional research into the most effective and economic control methods will continue in 2016.

#### Trapping wireworms and click beetles:

- A state-of-the-art apparatus for measuring CO<sub>2</sub> production was constructed, but field experiments in the first year failed to generate results. More work will be performed in 2016.
- A new low-technology click beetle light trap was developed and tested by Dr. Christine Noronha in PEI with positive results. For low cost, this simple pitfall trap with a solar-powered spotlight proved effective in trapping both male and female click beetles in significant numbers while minimizing collection of other species. Work is ongoing to refine this trap design and to implement in growers fields in 2016.

Significantly more information on recent wireworm research was printed on pages 13-16 of the March-April 2016 issue of the PEI Potato News.

# Potato Virus Y (PVY)

## CHC Cluster Project: Potato Virus Y

Principal Investigator: Dr. Mathuresh Singh, Agricultural Certification Services, Fredericton, NB. Primary research taking place in NB.

**Research Purpose:** To survey populations across Canada for strain identification; to characterize response of major varieties to PVY strains; to explore management practices to reduce on-farm spread of PVY

### Key Findings:

#### Tracking PVY strains in Canada

It appears that PVY<sup>NTN</sup> has replaced PVY<sup>O</sup> as the dominant strain of PVY in Canada. This recombinant strain shows relatively mild symptoms in most commercial potato cultivars in comparison to PVY<sup>O</sup>, making it difficult to ID and remove infected plants from the field. Also, research indicates that the PVY<sup>NTN</sup> strain is naturally more efficient at transmission than PVY<sup>O</sup>. Work will be ongoing to continue monitoring the status of PVY strains present across the country.

#### Varietal response to PVY strains

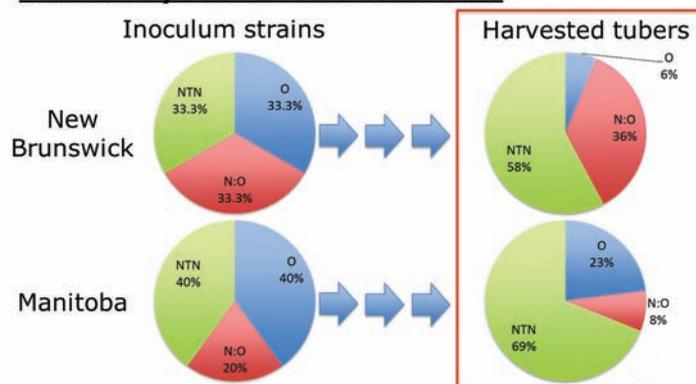
The research team has been investigating the response of each variety to the various strains of PVY, including effect on foliage and tubers. The recombinant strains of PVY (PVY<sup>NTN</sup> and PVY<sup>N:O</sup>) have been shown to display necrotic symptoms on some tubers. Meanwhile, the PVY<sup>O</sup> strain displays the largest effect on foliage, along with plant stunting and reduced tuber yield.

To date, 17 potato varieties have been screened for the effect of PVY strain. One variety (Envol) shows distinct tuber necrosis from PVY<sup>NTN</sup>. The variety Eva shows resistance to PVY for all strains, both in plant tissue and tubers. By the end of the project, at least 25 varieties will be screened in this manner.

## PINK ROT

**Resistance to Metalaxyl-M in Populations of the Potato Pink Rot Pathogen (*Phytophthora erythroseptica*) in Canada.** Research conducted by Dr. Rick Peters, AAFC. Two year project funded by Syngenta Canada, PEI Potato Board, Keystone Potato Producers Assoc. and Potato Growers of Alberta.

### Preliminary results from 2015 trials



### Management practices to reduce PVY

Trials were performed in both New Brunswick and Manitoba to assess the effectiveness of the use of mineral oil, insecticide, and both at preventing the spread of PVY. Trials were conducted in isolated potato fields with 10m x 10m plots. Two levels of mineral oil concentration, with and without supplementation with either 5 or 11 insecticide sprays for aphids, two insecticide-only spray treatments, and one control treatment were evaluated in replicate. Plots were initially planted with very low-virus seed, and then shortly after planting, several seed tubers were removed from each plot and replaced with a PVY infected tuber.

The most effective treatments at controlling PVY spread were those combining mineral oil and insecticide. However, there was little evidence that using oil concentrations above the industry standard reduced PVY spread. Similarly, the use of 11 insecticides over a range of chemistries was not more effective than the use of 5 conventionally used insecticides concentrated in the first half of the growing season. These results generally agree with previous field trials performed in New Brunswick.

### Key Findings:

- Approximately 50% of isolates from PEI are resistant to Ridomil.
- Phostrol and Presidio had high levels of effectiveness on both Ridomil-susceptible and Ridomil-resistant isolates.
- More work is taking place to assess strain resistance as well as product effectiveness.

# VARIETY EVALUATION

## Canadian Potato Variety Evaluation Program

Research in PEI conducted by David Main, AAFC as part of the CHC National Potato Research Cluster Project (Growing Forward 2).

## Climate Zone Variety Evaluation

Research at four American universities. Three year project funded through Applied Research Program of the PEI Department of Agriculture & Fisheries (GF2).

## Variety Evaluation for Starch Purposes

Research conducted by Genesis Crop Systems. One year project funded through Applied Research Program of the PEI Department of Agriculture & Fisheries (GF2).

### Key Findings:

#### Cluster Variety Trial, Harrington, PEI

- Four new red varieties outperformed the red standard (Norland), including AAFC cultivar AR2014-04 at 378 cwt/ac.
- All yellow varieties outperformed the yellow standard (Yukon Gold) for total yield, including Electra at 437 cwt/ac and Lanorma at 389 cwt/ac.
- Dione outperformed the russet standard (Goldrush) at 314 cwt/ac of Canada #1 yield.

#### Climate Zone Trial

- Two red varieties from AAFC Accelerated Release Program (AR2014-011 and AR2014-04) outperformed the standard at three of four sites, with AR2014-11 producing as much as 86% more marketable yield than the standard in the California trial.
- AR2014-09, a yellow variety, outperformed the standard at three sites, performing best in the more humid locations.
- Other varieties had more variable results.

#### Starch Variety Trial, Augustine Cove, PEI

- The Atlantic variety at 6 inch seed spacing showed the highest total yield and dry matter yield, followed closely by Russet Burbank (9 inch spacing), Ranger Russet (12 inch spacing), and Marcie (9 inch spacing). A second year of evaluation is planned for 2016.

A more detailed report on 2015 variety trial results can be found on pages 31-33 of the March-April 2016 issue of the PEI Potato News.

# CROP ROTATION

## Evaluating Oilseeds in Rotation with Potatoes

Research in PEI and Quebec by the Eastern Canadian Oilseeds Development Alliance Inc. Funded through an AgrilInnovation Program project (Growing Forward 2).

**Research Purpose:** To evaluate different crop rotations involving potatoes in combination with oilseed crops (soybeans, canola) and other crop species over a four year rotation cycle.

### Key Findings:

This project has completed two out of four years' worth of rotations thus far. Potatoes are being evaluated in each of the four years of the trial to ensure that the effect of a specific year will be minimized when compared across the entire trial.

Crops included in this rotation trial include potato, canola, soybean, corn, buckwheat, barley, winter wheat, and forages.

In a change from the original project plan, all evaluation in Atlantic Canada will be done directly by AAFC, after experiencing some issues with third party research collaborators.

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# VERTICILLIUM

## CHC Cluster Project: Verticillium Activity

Research in PEI conducted by Dr. Mario Tenuta, AAFC as part of the CHC National Potato Research Cluster Project (Growing Forward 2)

**Research Purpose:** To develop a fast and accurate method to quantify *Verticillium dahliae* and *Verticillium longisporum* in soil.

### Progress and Findings:

Samples from Prince Edward Island have been submitted to this project, but results have not yet been received.

Research on samples from Manitoba have shown a large amount of *Verticillium tricorpus*, not thought to be a potato pathogen, but requiring additional research. Primers that have been developed from this project appear to be reliable so far at quantifying the amount of *Verticillium* in soil, even at low levels.

# YIELD VARIABILITY

## PEI Potato Yield Variability Study

Research conducted by Steve Watts, Genesis Crop Systems. Three year project funded through Applied Research Program of the PEI Department of Agriculture & Fisheries (Growing Forward 2).

**Research Purpose:** To assess biological and physical characteristics of soil which may help to identify reasons for regions of high and low yields within a single field. Yield are assessed through yield monitors on harvesters, creating GPS yield maps of 15 individual fields. The following spring, each field is soil sampled to assess nutrients, structure, and soil-borne pests according to zones determined from yield maps from the previous potato crop.

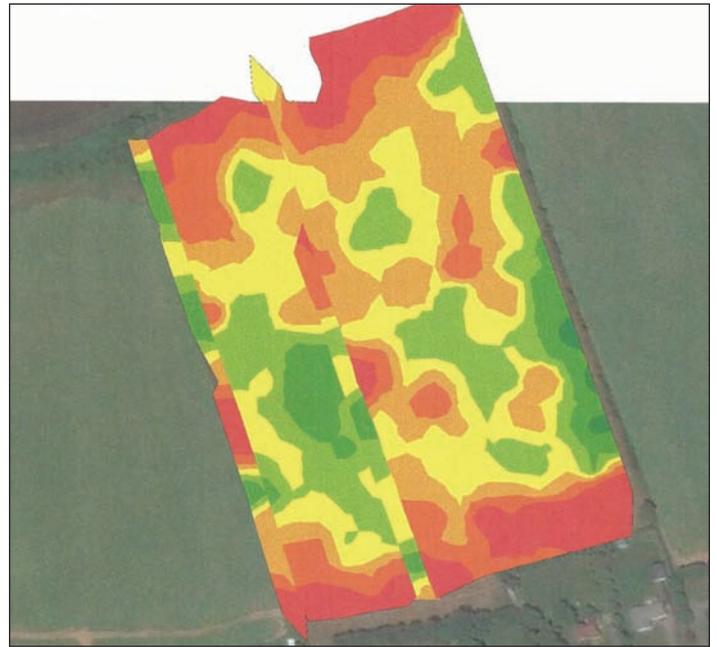
### Key Findings:

In each field, samples were analyzed for soil chemical analysis, soil organic matter, compaction, *Verticillium*, and root lesion nematode. In addition, samples were sent to Agriculture & Agri-Food Canada (AAFC) for analysis of additional soil health and soil structure attributes, but results have not yet been analyzed for these samples.

Again this year, root lesion nematode levels were quite high. The average across all samples was 4806 nematodes per kg of dry soil, which is only slightly lower than the economic threshold level for Russet Burbank (5000 RLN/kg). However, there was no visible trend for nematode counts to be higher in lower producing areas of the fields.

*Verticillium dahliae* was found at "severe" levels in all but 4 samples, while *Verticillium albo-atrum* was detected less frequently and a lower levels of severity. Again, there was not a clear trend relating severity of *Verticillium* to production level. In future years, there will be an effort to find ways to better quantify *Verticillium* populations.

Soil compaction levels were also generally high, with an average PSI of 207 across all samples; again, there was no observed trend in compaction between high and low yielding zones. Soil organic matter levels ranged from a



low of 0.98 to 4.61, but again, no discernable trend was observed.

So far, this research has not identified overall trends that strongly indicate reasons for yield drag. However, in looking at individual fields, there are sometime observed differences in soil characteristics that may be related to limited yield potential.

### Future Plans:

This project will conclude in 2016, when soil samples are analyzed in fields that were measured for yield in the fall of 2015. In addition, we hope to get more information on soil characteristics from samples to be analyzed by AAFC.

It also seems likely that the primary reason that we have thus far been able to observe overall trends from the existing data is due to the limited number of samples per field. As a result, this project will be restructured for two more crop years to look at a smaller number of fields but with a larger number of soil tests per field, with the hope of better identifying what soil characteristics are having the greatest impact on yield.

# STORAGE

## Investigating Optimum Potato Storage Practices for Prince Edward Island

Research conducted by Cavendish Agri-Services. Three year project funded through Applied Research Program of the PEI Department of Agriculture & Fisheries (Growing Forward II).

**Research Purpose:** This project aims to identify areas for improvement in potato storage under conditions experienced in Prince Edward Island. Specific studies within this project will include assessing insulation of different storage designs, examining the effectiveness and cost associated with different models of ventilation fans, and assessing how shrink varies over time under different storage/ventilation conditions.

### Key Findings:

Testing of different ventilation fans was previously completed and reported in last year's research update. Likewise, evaluation of different storages using thermal imaging to identify insulation limitations was also done in the previous two years and was also included in last year's report.

Following the 2014 harvest, thirteen grower storages storing four varieties (Shepody, Prospect, Russet Burbank, and Ranger Russet) had nine pre-weighed samples placed into onion bags and then deposited in the potato pile as potatoes entered storage. Bags were placed in the top, middle, and bottom of the pile, as well as the front, middle and back of the pile. Samples were then weighed when potatoes were removed from storage. Removal ranged from 16 to 289 days after harvest, but the majority of samples were stored for more than 150 days. Samples from one storage were excluded from analysis due to sample loss.

Across twelve storages, the average shrink rate was 4.98 percent. Vertically speaking, shrink was observed to be higher at the bottom of the pile (5.91%) versus the middle and top (4.54% and 4.80%, respectively). Horizontally speaking, potatoes at the back of the pile saw the largest shrink (5.33%) compared to the middle and front (5.03%



and 4.73%, respectively).

It was hard to accurately depict the relationship between shrink and days in storage due to the smaller number of sample removed before 100 days in storage. Nonetheless, it does appear that the majority of shrink takes place in the first 150 days of storage, which is consistent with results from other studies. Shrink percentages in storages emptied between 211 to 260 days in storage were not markedly different from percentages in storages emptied between 261 and 300 days in storage.

### Future Research:

Using results from the 2014 crop as solid benchmark, this storage research was modified for the 2015 crop to look more closely at the rate of shrink through the growing season, as well as how shrink may be correlated to ventilation conditions. A smaller number of grower storages had multiple pre-weighed samples placed at the front of their piles this year; however, this year the samples have been weighed on a consistent basis throughout the storage season to get a more accurate picture of how shrink changes through the growing season.

In addition, there was an intent to pair storages with similar entry dates and variety but with different storage conditions to see what effect ventilation conditions or storage construction has on observed shrink. These results will be available later in 2016 after the rest of the crop is emptied from storage.

# SOIL MANAGEMENT

## Mitigating Limitations to On-Farm Yield

Three year funding commitment through AgrilInnovation Program, Potatoes New Brunswick, McCain Foods, Prince Edward Island Potato Board, and additional partners.

**Research Purpose:** To identify limitations for yield, and to explore ways to counteract these limitations through addressing soil erosion, soil health, and other beneficial production practices.

## Key Findings of PEI trials:

### Nurse Crops

- A nurse crop screening trial was started in 2015 at the AAFC research farm in Harrington, PEI to identify species which might prove beneficial as a nurse crop to be planted at the same time as potatoes in the spring. This nurse crop would provide protection to the soil before potatoes emerge and/or achieve row closure.
- Four crops were tested: winter rye, brown mustard, buckwheat, and oats. Of the four crops tested, only winter rye produced yields comparable with no nurse crop, as the other three persisted through the growing season and acted like weeds to reduce yields.
- For 2016, there are plans to alter how the nurse crops are planted as well as experimenting with how to best incorporate or kill the nurse crop as the potatoes emerge. This will be done on a commercial field scale this year. There will also be a replicated trial done at Harrington.

### Late-Season Cover Crops

- There is a desire to identify plant species which can serve as an effective late-season cover crop after potato harvest. A number of growers already broadcast cover crops like winter rye or ryegrass, but this is most prevalent in potatoes harvested in September (seed, early table, chip, etc).
- In the fall of 2015, a screening trial was performed at Harrington looking at two seeding dates: late September and mid-October.
- Winter rye established at both seeding dates, though it established better in September. Root max ryegrass and a mix of radish/rape/oats/peas established well in



*Winter rye seeded on October 15th*

September but less so in October. Winter rape, Italian ryegrass, and peas alone did not establish well at either planting date.

- For 2016, spring barley, winter wheat, and winter rye will be evaluated at two planting dates, one in late September and the other on approx. October 8th. This will be done at Harrington and in a conventional grower field.

## Residue Tillage Systems

- A trial was started in the fall of 2015. This trial has two components:
  - Measuring water infiltration rates and organic matter on tillage done on forage land, comparing moldboard plowing, Lemken in the fall, and Lemken in the spring.
  - Measuring water infiltration rates and organic matter on tillage performed on potato fields after harvest, with the intent to reduce compaction and incorporate potato vines. Comparing Lemken with rolling baskets, Lemken with packing wheels, and a modified chisel plow with a dammer diker.
- These trials will be monitored through the growing season, and yield samples will be taken in the fall of 2016.



## The PEI Potato Board is coordinating and contributing funding to the following projects in 2016-2017:

### **PEI Potato Yield Variability Study**

Three year project funded with PEI Agriculture Applied Research Program. To be renewed for two additional years. Research performed by Genesis Crop Systems

### **Resistance to Metalaxyl-M in Populations of the Potato Pink Rot Pathogen (*Phytophthora erythroseptica*) in Canada**

Two year project funded with Potato Growers of Alberta, Keystone Potato Producers Association, and Syngenta Canada. Research performed by Agriculture & Agri-Food Canada.

### **Testing Canadian Bred Varieties in Different Climate Zones in the USA that represent Global Climate Zones**

Three year project funded with PEI Agriculture Applied Research Program. Research performed by US research universities on behalf of PEI Potato Board

### **National Potato Research Cluster, investigating PVY, Wireworm, PCR testing for Verticillium, Variety Evaluation, and Zebra Chip.**

Five year funding commitment through Growing Forward II Program and multiple industry partners

### **Oilseeds East: Market-Driven Research for Soybean and Canola Supply Chain Profitability**

Five year funding commitment through AgrilInnovation Program, ECODA and its multiple industry partners. Research into rotations with potatoes performed by Aaron Mills, Agriculture & Agri-Food Canada

### **Potato Variety Evaluation for Starch Purposes**

One year project funded with PEI Agriculture Applied Research Program. Research performed by Genesis Crop Systems

### **Securing Export Markets for Potato Processors by Mitigating Limitations to On-Farm Yield**

Three year funding commitment through AgrilInnovation Program, Potatoes New Brunswick, McCain Foods, Prince Edward Island Potato Board, and additional partners. Research conducted by Agriculture & Agri-Food Canada in New Brunswick, Manitoba and Prince Edward Island.

### **Characterization and Tracking of Strains of Potato Late Blight Pathogen in Canada**

Three year funding commitment through AgrilInnovation Program and multiple provincial industry partners. Research conducted by Agriculture & Agri-Food Canada in Prince Edward Island and Alberta.

### **Development of an RNAi Approach to Control Wireworms on PEI**

Two year project funded with PEI Agriculture Applied Research Program, Cavendish Farms, PEI Horticultural Association, and Genome Atlantic. Research conducted by Dr. Gefu Wang-Pruski, Dalhousie Faculty of Agriculture.

More details on Board-supported research projects are available by contacting  
Ryan Barrett, Research Coordinator, at:  
ryan@peipotato.org or (902) 892-6551

As they become available, full results of research projects will be made available on the  
PEI Potato Board Growers Site: [www.peipotato.org/growers-site](http://www.peipotato.org/growers-site)