Long-term storability of *Potato Virus Y* infected tubers: the differential impact of PVY$_{O}$ and the new PVY$_{N:O}$ strain

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Wisconsin Potato and Vegetable Growers Association

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Potato virus Y (PVY) re-emergence in the United States and Canada

- Asymptomatic varieties and imported seed:
  - ‘Silverton Russet’
  - ‘Russet Norkotah’
  - ‘Shepody’

- Recently introduced and highly mobile vector:
  - Soybean aphid (*Aphis glycines*)

- Recombinant strains of PVY
# Potato virus Y recombinant strains

<table>
<thead>
<tr>
<th>PVY strain</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVY\textsubscript{O}</td>
<td>49</td>
<td>39</td>
<td>108</td>
<td>196</td>
</tr>
<tr>
<td>PVY\textsubscript{N:O}</td>
<td>2 (3.9%)</td>
<td>26 (40.0%)</td>
<td>45 (29.4%)</td>
<td>73</td>
</tr>
<tr>
<td>PVY\textsubscript{N} or NTN</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mix of strains</td>
<td>0</td>
<td>0</td>
<td>2 (1.3%)</td>
<td>2</td>
</tr>
</tbody>
</table>

- **PVY\textsubscript{O}**: 39 samples in 2005 (40.0% of total)
- **PVY\textsubscript{N:O}**: 2 samples in 2004 (3.9%), 26 samples in 2005 (40.0%), 45 samples in 2006 (29.4%) for a total of 73 samples.
- **PVY\textsubscript{N} or NTN**: No samples in 2004, 2005, or 2006.
- **Mix of strains**: No samples in 2004, 2005, or 2006, but 2 samples for a total of 2.

S. M. Gray (2007)
Past Research: Potato virus Y Movement

**Frequency of Tuber Infection**

- **2001**
  - Atlantic: P=0.0037
  - R. Norkotah: P=0.0208
  - Shepody: P=0.0744

**Quality Losses**

- **2001**
  - Presque Isle, ME
  - Newport, ME

**Mean specific gravity**

- Cultivar: SHEP, RNOR, ATL
  - PVY Inoculation Time:
    - Pre-flower
    - Post-flower
    - Healthy

**Proportion PVY infected tubers**

- Weeks Post-planting: 0, 2, 4, 6, 8, 10

**Cultivar**

- Atlantic
- R. Norkotah
- Shepody
Research Objectives

- Investigate how the timing of PVY infection within the growing season and PVY strain (PVY$_{O}$, and PVY$_{N:O}$) can affect the efficiency of tuber infection and the resulting long-term storability of harvested tubers.

- Characterize and qualify the symptom expression on emerging shoots generated from tubers with known infections of different PVV strains (PVY$_{O}$, and PVY$_{N:O}$) during the winter grow-out tests.

- Demonstrate the feasibility of implementing a limited-scale, greenhouse-based, winter grow-out test to effectively index the incidence of PVY infection between strains and among selected cultivars.
I. PVY Field Study & Storage Trial, Hancock AES

* RCBD (4 varieties, 2 inoculation times, and 2 PVY strains)
  2.) Inoculation Time (pre-, & post-flower)
  3.) PVY strains (PVY₀ & PVYₙ:₀)
  4.) ‘Villetta Rose’ guard rows
  5.) DAS-ELISA

* Storage: Processing (47°F, 95% RH)
  Fresh Market (42°F, 95% RH)

* Quality Parameters (Harvest, 3, 6, 12, 18, 24, & 36 mo)
  1.) Tuber weights
  2.) Specific gravity
  3.) Sprouting
  4.) Internal defect (s)
II. PVY Strain, Florida Grow-Out Tests

- Document strain specific differences among symptomatic & asymptomatic cultivars
- Improve our ability to accurately identify novel strains (PVY\textsubscript{N:O}) within potato cultivars during the winter grow-out tests

<table>
<thead>
<tr>
<th>Score</th>
<th>Symptom type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>healthy</td>
</tr>
<tr>
<td>1</td>
<td>possible mosaic (e.g. ‘Gemstar Russet’)</td>
</tr>
<tr>
<td>2</td>
<td>mild mosaic / mild distortion (e.g. ‘Silverton’)</td>
</tr>
<tr>
<td>3</td>
<td>mosaic / distorted leaves (e.g. ‘Russet Norkotah’ &amp; ‘Atlantic’)</td>
</tr>
<tr>
<td>4</td>
<td>strong mosaic / distorted leaves (e.g. several varieties)</td>
</tr>
<tr>
<td>5</td>
<td>leaf drop symptoms / plant death (e.g. ‘Goldrush’, ‘Red Norland’).</td>
</tr>
</tbody>
</table>
III. Develop Greenhouse Based, Winter Grow-Out Certification

▸ Demonstrate the feasibility of implementing a greenhouse-based, winter grow-out test to effectively index the incidence of PVY infection between strains and among selected cultivars.

  a.) cultivars
  b.) PVY strains
  c.) inoculation times
QUESTIONS?