2014 Vermont Apple Season Roundup
(& a look ahead to 2015)

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TREE FRUIT & VITICULTURE SPECIALIST
UNIVERSITY OF VERMONT
119TH ANNUAL VTFGA & UVM APPLE PROGRAM ANNUAL MEETING
FEBRUARY 12, 2015
2014: The crop that wasn’t?
2014: The crop that wasn’t?

• Total production down in Vermont ~40% from five-year average
• Crop uneven overall
  • Great crop in Grand Isle county
• Over production in 2013
• Winter damage Dec 2013, Feb 2014

• Prepare to thin in 2014
Disease management 2014

2014 Spring Weather Conditions and Major Disease Events at UVM Hort Research & Education Center
South Burlington, VT

- Total Rain (in)
- Min Temp (F)
- Max Temp (F)
- FB Infection (H or I)
- FB EIP = 100
- FB EIP = 821
- 1" Apple Scab Infection Period

Key Events:
- Green Tip
- First Bloom
- Petal Fall
- EIP=100
- EIP = 821

Research Projects, 2014
E-IPM Outreach

UVM Fruit website, mailing list, & blogs
• Site redesign & blog added April 2014
• 76 posts since April 2014
• Continued support 2015
• Grower Survey
E-IPM Outreach

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• 76 posts since April 2014
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NEWA IPM Application
• newa.cornell.edu
• Six airports, nine on-site weather stations
Biological management of apple replant disease

NORTHEAST SARE
Biological management of apple replant disease

Post-plant assessment of biofungicides/bionematicide materials against ARD

ARD is a disease caused by a complex of nematodes, fungi, and bacteria that reduce tree growth and productivity
Biological management of apple replant disease

Two materials:
• MeloCon (Certis)
• Actinovate (Novozymes/Monsanto BioAg)

Two sites
• South Hero
• South Burlington

Four soil injections/year
# Preliminary data:

TCSA: Increase with Melocon at one site

<table>
<thead>
<tr>
<th>Site</th>
<th>Treatment</th>
<th>TCSA increase, %</th>
<th>value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HREC</td>
<td>NTC</td>
<td>32.9</td>
<td>0.7417</td>
<td></td>
</tr>
<tr>
<td>HREC</td>
<td>ACT</td>
<td>32.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HREC</td>
<td>MCN</td>
<td>30.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>NTC</td>
<td>67.4 b</td>
<td>0.0003</td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>ACT</td>
<td>62.6 b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>MCN</td>
<td>72.9 a</td>
<td></td>
<td></td>
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</tbody>
</table>
Preliminary data:

<table>
<thead>
<tr>
<th>Site</th>
<th>Treatment</th>
<th>Terminal leader growth, cm</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>value</td>
<td></td>
</tr>
<tr>
<td>HREC</td>
<td>NTC</td>
<td>11.2 c</td>
<td>0.0001</td>
</tr>
<tr>
<td>HREC</td>
<td>ACT</td>
<td>23.2 a</td>
<td></td>
</tr>
<tr>
<td>HREC</td>
<td>MCN</td>
<td>19.6 b</td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>NTC</td>
<td>41.0 a</td>
<td>0.0002</td>
</tr>
<tr>
<td>SHVT</td>
<td>ACT</td>
<td>31.9 b</td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>MCN</td>
<td>31.7 b</td>
<td></td>
</tr>
</tbody>
</table>

**TCSA:**
- Increase with Melocon at one site

**Leader growth:**
- Actinovate increased growth at one site,
- NTC had greatest growth at another
**Preliminary data:**

<table>
<thead>
<tr>
<th>Site</th>
<th>Treatment</th>
<th>Terminal shoot growth, cm</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HREC</td>
<td>NTC</td>
<td>11.7 b</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>HREC</td>
<td>ACT</td>
<td>15.4 a</td>
<td></td>
</tr>
<tr>
<td>HREC</td>
<td>MCN</td>
<td>14.6 a</td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>NTC</td>
<td>32.2 a</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>SHVT</td>
<td>ACT</td>
<td>25.5 b</td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>MCN</td>
<td>27.2 b</td>
<td></td>
</tr>
</tbody>
</table>

**TCSA:**
- Increase with Melocon at one site

**Leader growth:**
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**Terminal shoot growth:**
- Inconsistent results
### Preliminary data:

**TCSA:**
- Increase with Melocon at one site

**Leader growth:**
- Actinovate increased growth at one site,
- NTC had greatest growth at another

**Terminal shoot growth:**
- Inconsistent results

**Kg fruit/tree**
- No effect @ HREC
- Actinovate had greater crop yield than Melocon at S Hero

<table>
<thead>
<tr>
<th>Site</th>
<th>Treatment</th>
<th>Kg fruit/tree</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HREC</td>
<td>NTC</td>
<td>1.27</td>
<td>0.9445</td>
</tr>
<tr>
<td>HREC</td>
<td>ACT</td>
<td>1.23</td>
<td></td>
</tr>
<tr>
<td>HREC</td>
<td>MCN</td>
<td>1.24</td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>NTC</td>
<td>3.67 ab</td>
<td>0.0016</td>
</tr>
<tr>
<td>SHVT</td>
<td>ACT</td>
<td>4.37 a</td>
<td></td>
</tr>
<tr>
<td>SHVT</td>
<td>MCN</td>
<td>3.17 b</td>
<td></td>
</tr>
</tbody>
</table>
Changes in soil community

**Pratylenchidae**

- **Hort Farm**
- **South Hero**

**Meloidogyne**

- **South Hero**
- **Hort Farm**
Cider apple production systems
Cider apple production systems

Working Lands Enterprise Fund
USDA Federal State Market Improvement Program

Industry surveys:
• Grower & Cidery
• Production and utilization capacity
• Price points

<table>
<thead>
<tr>
<th>Route</th>
<th>Mean percent</th>
<th>Median percent</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the farm sold as fresh fruit</td>
<td>33.6</td>
<td>32.5</td>
<td>31.4</td>
</tr>
<tr>
<td>On the farm sold as juice</td>
<td>11.5</td>
<td>3.0</td>
<td>18.1</td>
</tr>
<tr>
<td>To wholesalers</td>
<td>18.4</td>
<td>0.0</td>
<td>32.2</td>
</tr>
<tr>
<td>Directly to stores</td>
<td>15.3</td>
<td>0.0</td>
<td>28.3</td>
</tr>
<tr>
<td>To sweet cider processors</td>
<td>7.6</td>
<td>0.0</td>
<td>17.4</td>
</tr>
<tr>
<td>To cideries</td>
<td>8.4</td>
<td>0.0</td>
<td>21.3</td>
</tr>
<tr>
<td>Other</td>
<td>5.1</td>
<td>0.0</td>
<td>16.7</td>
</tr>
</tbody>
</table>
Cider apple production systems

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USDA Federal State Market Improvement Program

Industry surveys:
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<table>
<thead>
<tr>
<th>Apple type</th>
<th>n</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>Average price difference in $US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialty cider/bittersweet</td>
<td>2</td>
<td>8.25</td>
<td>4</td>
<td>12.5</td>
<td>13.7</td>
<td>10</td>
<td>17.5</td>
<td>-5.45</td>
</tr>
<tr>
<td>Dessert variety tree pick</td>
<td>2</td>
<td>5.75</td>
<td>4</td>
<td>7.5</td>
<td>8.0</td>
<td>6.0</td>
<td>10.0</td>
<td>-2.25</td>
</tr>
<tr>
<td>Dessert variety cull</td>
<td>1</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>0</td>
</tr>
<tr>
<td>Dessert variety drop</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>-</td>
</tr>
</tbody>
</table>
Cider apple production systems

Working Lands Enterprise Fund
USDA Federal State Market Improvement Program

Orchard and cultivar data
• Production by cultivar & orchard system
• Cultivar juice characteristics

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Bushels / acre</th>
<th>Firmness (psi)</th>
<th>Starch index</th>
<th>Soluble solids (*brix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortland</td>
<td>672</td>
<td>15.9</td>
<td>3.7</td>
<td>10.3</td>
</tr>
<tr>
<td>Empire</td>
<td>932</td>
<td>18.8</td>
<td>5.0</td>
<td>12.8</td>
</tr>
<tr>
<td>Idared</td>
<td>1221</td>
<td>17.4</td>
<td>4.0</td>
<td>10.6</td>
</tr>
<tr>
<td>Jonagold</td>
<td>338</td>
<td>16.0</td>
<td>7.4</td>
<td>12.8</td>
</tr>
<tr>
<td>Liberty</td>
<td>282</td>
<td>17.5</td>
<td>6.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Macoun</td>
<td>705</td>
<td>15.4</td>
<td>5.0</td>
<td>10.9</td>
</tr>
<tr>
<td>McIntosh</td>
<td>1134</td>
<td>15.2</td>
<td>4.6</td>
<td>11.6</td>
</tr>
<tr>
<td>Paula Red</td>
<td>435</td>
<td>17.1</td>
<td>3.4</td>
<td>11.3</td>
</tr>
</tbody>
</table>
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USDA Federal State Market Improvement Program

Orchard and cultivar data

• Production by cultivar & orchard system

• Cultivar juice characteristics

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Soluble solids (*brix)</th>
<th>pH</th>
<th>Malic acid (mg/l)</th>
<th>Total polyphenols (%)</th>
<th>YAN (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashmead's Kernel</td>
<td>17.6</td>
<td>3.25</td>
<td>10.40</td>
<td>0.075</td>
<td>262.4</td>
</tr>
<tr>
<td>Commercial blend</td>
<td>12.2</td>
<td>3.40</td>
<td>5.91</td>
<td>0.037</td>
<td>58.5</td>
</tr>
<tr>
<td>Cortland</td>
<td>11.2</td>
<td>3.43</td>
<td>4.74</td>
<td>0.047</td>
<td>45.1</td>
</tr>
<tr>
<td>Dabinet</td>
<td>13.1</td>
<td>4.13</td>
<td>1.68</td>
<td>0.109</td>
<td>60.6</td>
</tr>
<tr>
<td>Esopus Spitzenburg</td>
<td>15.3</td>
<td>3.48</td>
<td>7.10</td>
<td>0.035</td>
<td>113.4</td>
</tr>
<tr>
<td>Honeycrisp</td>
<td>12.6</td>
<td>3.52</td>
<td>4.97</td>
<td>0.027</td>
<td>85.0</td>
</tr>
<tr>
<td>Idared</td>
<td>10.8</td>
<td>3.29</td>
<td>5.98</td>
<td>0.017</td>
<td>15.5</td>
</tr>
<tr>
<td>Jonagold</td>
<td>12.3</td>
<td>3.40</td>
<td>6.12</td>
<td>0.021</td>
<td>38.6</td>
</tr>
<tr>
<td>Liberty</td>
<td>11.5</td>
<td>3.45</td>
<td>5.72</td>
<td>0.018</td>
<td>58.7</td>
</tr>
<tr>
<td>Macoun</td>
<td>11.7</td>
<td>3.47</td>
<td>4.17</td>
<td>0.021</td>
<td>65.1</td>
</tr>
<tr>
<td>McIntosh</td>
<td>11.7</td>
<td>3.25</td>
<td>5.48</td>
<td>0.036</td>
<td>30.1</td>
</tr>
<tr>
<td>PaulaRed</td>
<td>11.0</td>
<td>3.40</td>
<td>4.45</td>
<td>0.050</td>
<td>30.4</td>
</tr>
<tr>
<td>Topaz</td>
<td>12.4</td>
<td>3.35</td>
<td>9.88</td>
<td>0.056</td>
<td>16.1</td>
</tr>
<tr>
<td>Wickson</td>
<td>13.9</td>
<td>3.40</td>
<td>11.94</td>
<td>0.018</td>
<td>53.3</td>
</tr>
</tbody>
</table>
Cider apple production systems

Working Lands Enterprise Fund

USDA Federal State Market Improvement Program

Fermentation characteristics

- Ciders fermented at three commercial cideries
- Spring 2015: evaluation of finished ciders to characterize cider quality
Amend the section of the tax code to allow cider makers to produce cider using the natural products available without the possibility of facing increased tax liability

- increase the carbonation level for hard cider, thereby meeting customer expectations,
- include pears in the definition of "hard cider," and
- align the alcohol-content standard for hard cider with the natural sugar content of apples.
2015 Projects

E-IPM Outreach Program

SARE Apple Replant Disease

Cider Apple Production
- In-depth financial analysis of costs to produce cider apples in VT
- Increased replication across orchards
- Phenology data
- Developing database of characteristics of apple cultivars used for hard cider

Biopesticide management of cedar apple rust on scab-resistant cultivars
2015 Undergraduate & Continuing Education Courses

PSS 209 Sustainable (Vegetable) Farm Practicum

• Instructors: Susie Walsh Daloz and Terry Bradshaw

• Dates: May 18-August 5, 2015 (On-line coursework is from May 18-27 and August 3 - 5; On-farm practicum is MW from June 1-July 29)

PSS 195 Sustainable Orchard and Vineyard Management

• Instructor: Terry Bradshaw

• Dates: TR, June 15 - July 10, 2015
2015 UVM Apple Program

Terence Bradshaw
  ◦ UVM Tree Fruit & Viticulture Specialist
  ◦ College of Agriculture & Life Science

Ann Hazelrigg
  ◦ Director, UVM Plant Diagnostic Clinic
  ◦ UVM Extension

Sarah Kingsley-Richards
Jessica Foster
  ◦ Research Technicians

Dr. David Conner
  ◦ Agricultural Economist
  ◦ UVM Dept Community Dev & Appl Economics

Florence Becot
  ◦ Research Specialist, CDAE

Funding acknowledgements:

Vermont Working Lands Enterprise Fund
  ◦ Apple Market Optimization and Expansion through Value-Added Hard Cider Production

USDA FSMIP
  ◦ Orchard Economic Assessment to Support Vermont Hard Cider Production

USDA Extension Integrated Projects Program
  • The Transdisciplinary Vermont Extension IPM Program
    Addressing Stakeholder Priorities and Needs for 2013-2016

Northeast SARE
  ◦ Biological Management of Apple Replant Disease

Vermont Agricultural Experiment Station
Vermont Tree Fruit Growers Association
Vermont Hard Cider Company
Monsanto BioAg