Preliminary Results: Economic Impacts of Spotted Wing Drosophila for MN Raspberry Industry
SWD Economic Implications

What is Spotted Wing Drosophila (SWD)?

• *Drosophila suzukii*, Matsumura
• Invasive pest, fruit fly
• Favors raspberries as host fruit
• Deposits eggs using serrated ovipositor
• Larvae degrade fruit making them soft, discolored and unmarketable
• First detected in MN in 2012, 29 counties
SWD Economic Implications

Research funding from *Minnesota Invasive Terrestrial Plants and Pests Center* awarded in 2017 to explore:

- SWD migration and overwintering capabilities
- Efficacy of alternative SWD control strategies
- Economic impact of SWD on MN raspberry production
- Cost effectiveness of SWD control strategies
SWD Economic Implications

MN Raspberry Production: 2017 Survey

- 82 survey responses (52% response rate)
- 45 growers = raspberries (<15% of MN growers)
- Open field = 90%
- High Tunnel = 8%
- Organic = 47% (12% certified)
- More than 90% = Direct-to-consumer (mostly PYO)
SWD Economic Implications

Survey: 79% of raspberry growers experienced some level of SWD infestation in 2017.

Photo: Mary Rogers, University of Minnesota.
SWD Economic Implications

Survey: Raspberry growers median SWD-related yield loss was 20% in 2017

• Low = 2%
• High = 100%
• Mean = 30%
• Median = 20%
• Average >20% loss = 60%
SWD Economic Implications

Methodology for calculating value of yield loss:

\[ \$ = (P*Yl)*r \]

Where:

\$ = Aggregate value of yield loss
P = ex-ante production (2007-2009)
Yl = SWD yield loss rate
$r = 2007 Midwest retail price for fresh raspberries
SWD Economic Implications

\[ P = \text{acres} \times \text{yield} \]

Acreage data come from:
- Non-organic = USDA Census of Ag, 2007

Yield data come from:
- Non-organic = U of MN field trial experiments, 2009.
## SWD Economic Implications

### Raspberry production, ex-ante SWD

<table>
<thead>
<tr>
<th>Minnesota</th>
<th>2007 Acreage (# acres)</th>
<th>2008-2009 Yield (lbs/acre)</th>
<th>Production (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline production</td>
<td>296</td>
<td>4,708</td>
<td>1,393,568</td>
</tr>
<tr>
<td>Certified organic, red, open field</td>
<td>5</td>
<td>1,307</td>
<td>6,535</td>
</tr>
<tr>
<td>Non-organic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- red, open field</td>
<td>254</td>
<td>4,708</td>
<td>1,195,832</td>
</tr>
<tr>
<td>- black, open field</td>
<td>13</td>
<td>2,000</td>
<td>26,000</td>
</tr>
<tr>
<td>- red, high tunnel</td>
<td>24</td>
<td>22,253</td>
<td>534,072</td>
</tr>
<tr>
<td>Adjusted production</td>
<td>296</td>
<td></td>
<td>1,762,439</td>
</tr>
</tbody>
</table>
## SWD Economic Implications

Retail value of raspberry production, ex-ante SWD

<table>
<thead>
<tr>
<th>Minnesota</th>
<th>2007 – 2009 adjusted production (lbs)</th>
<th>2007 retail value ($/lb)</th>
<th>2007 value ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified organic, red, open field</td>
<td>6,535</td>
<td>7.44</td>
<td>48,620</td>
</tr>
<tr>
<td>Non-organic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- red, open field</td>
<td>1,195,832</td>
<td>6.23</td>
<td>7,450,033</td>
</tr>
<tr>
<td>- black, open field</td>
<td>26,000</td>
<td>6.23</td>
<td>161,980</td>
</tr>
<tr>
<td>- red, high tunnel</td>
<td>534,072</td>
<td>6.23</td>
<td>3,327,269</td>
</tr>
<tr>
<td>Total value, MN raspberry crop</td>
<td></td>
<td></td>
<td>10,987,902</td>
</tr>
</tbody>
</table>
## SWD Economic Implications

### Impact of SWD on Raspberry Yield

<table>
<thead>
<tr>
<th></th>
<th>Organic raspberries (lbs)</th>
<th>Non-organic raspberries (lbs)</th>
<th>Total raspberries (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Adjusted Baseline Production</td>
<td>6,535</td>
<td>1,755,904</td>
<td>1,762,439</td>
</tr>
<tr>
<td>20% Yield Loss</td>
<td>1,307</td>
<td>351,181</td>
<td>352,488</td>
</tr>
<tr>
<td>30% Yield Loss</td>
<td>1,961</td>
<td>526,771</td>
<td>528,732</td>
</tr>
<tr>
<td>60% Yield Loss</td>
<td>3,921</td>
<td>1,053,542</td>
<td>1,057,463</td>
</tr>
</tbody>
</table>
# SWD Economic Implications

## Retail Value of SWD Raspberry Revenue Loss

<table>
<thead>
<tr>
<th></th>
<th>Organic raspberry revenue loss ($)</th>
<th>Non-organic raspberry revenue loss ($)</th>
<th>Total raspberry revenue ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Avg. Midwest Retail $</td>
<td>7.44/lb</td>
<td>6.23/lb</td>
<td>-</td>
</tr>
<tr>
<td>20% Yield Loss</td>
<td>9,724</td>
<td>2,187,858</td>
<td>2,197,132</td>
</tr>
<tr>
<td>30% Yield Loss</td>
<td>14,590</td>
<td>3,281,783</td>
<td>3,296,373</td>
</tr>
<tr>
<td>60% Yield Loss</td>
<td>29,172</td>
<td>6,563,567</td>
<td>6,592,739</td>
</tr>
</tbody>
</table>
SWD Economic Implications

Survey: 74% of MN growers surveyed are actively managing to control SWD.

Photo: Out of My Shed blog.
Photo: University of Maine Cooperative Extension
Photo: University of Minnesota
SWD Economic Implications

SWD Control Measures Used by MN Raspberry Growers in 2017

- Conventional, non-organic pesticide
- Organic pesticide
- Sanitation
- Physical exclusion
- Mass trapping
- Other (n = 49)
SWD Economic Implications

Take Home Ideas:

• Most MN raspberry growers surveyed are non-commercial, PYO operations that manage in open field growing conditions.

• Median SWD-related raspberry yield loss in MN is 20% or more once infestation reaches critical level.

• SWD-related yield loss cost MN raspberry industry approximately $2.2 million in 2017.
SWD Economic Implications

Next steps (2018 – 2019):

• Compare actual 2017 raspberry production to estimates (USDA census data available January 2019)

• Estimate labor and material costs of SWD control for MN raspberry industry

• Compile aggregate SWD control costs for raspberries using labor and material input expenses

• Evaluate cost-effectiveness of alternative SWD control strategies
More Information

Project name: Overwintering, Migration and Development of Cost Effective Practical Management Strategies for the Invasive Spotted Wing Drosophila

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