Spotted Wing Drosophila
A new pest of fruit in Wisconsin

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US Distribution and economics

- First detected in California in 2008
- Crop losses estimated at $720 million annually
- Costs of SWD management estimated at $130-170 million
2014 State-wide monitoring for first detection

- First detection in Vernon county on June 30th
- 1 week later than 2013
Wisconsin detections since 2012

As of 2014, SWD confirmed in 33 counties and suspected in 9
2014 Adult phenology

- 3 farms in Dane county, 9 traps total
- First detection on July 15\textsuperscript{th} (2 weeks later than Vernon)
- Peak around 3\textsuperscript{rd} week of September (same as 2013)
- Numbers higher in 2014 but used ACV in 2013
2013 State-wide, season-long monitoring

Does SWD overwinter in WI?

• pattern of appearance throughout state does not suggest flies coming with wind storms
• would expect to occur earlier with other migratory aerial plankton, e.g. potato leafhopper, eastern flower thrips
• populations not evenly distributed (neighbors not affected)

Populations not established everywhere...yet...

Different susceptibility for different fruit crops

Proximity of berries to other suitable crops or wild hosts?
SWD winterform

Summer vs winter form showing melanization (female shown to scale)


Shearer & Brown
Can SWD overwinter?

New study by Shearer et al. (unpublished)

- In Oregon:
  - August: 100% summer morph
  - Early October: 50/50 summer/winter morphs
  - December: 100% winter morph females

- Time to 50% mortality at 1°C (34°F)
  - summer females: 23-28 days
  - winter females: ~180 days!
Seasonal pattern of SWD morphs

Monthly presence of SWD seasonal morphs throughout the 2014 growing season at 3 marshes in Dane county
Monitoring

- Plastic 32 oz. deli cup
- Drill or melt ~ten 3/16” holes
- Add ~1 inch of bait:
  - apple cider vinegar or
  - 1 tbsp. active dry yeast + 4 tbsp. sugar + 12 oz. water
- Add drop of soap
- Hang in fruit canopy near fruit, in shade
- Change bait weekly
- Check weekly and record catches
- ~1 trap / acre
2013 Multistate bait comparison

Wisconsin, raspberries

Total SWD captures

\[ F_{\text{state* treatment}} = 5.81; \text{ df } = 44, 1067; p < 0.0001 \]
Bait and trap comparison

More surface area on the entrance in Pherocon trap

Pherocon trap $8.25
Baits available commercially

- Trécé SWD combo lures
  Available from Great Lakes IPM
  $3.45/lure

- Scentry V2 lures
  Available from Great Lakes IPM
  $6/lure

- Suzukii Trap
  (actually bait not trap!)
  From Europe

Base of all of these attractants is wine and vinegar
Detection

To see presence of eggs on berry surface:
Look for breathing tubes and pits on fruit surface

To check for larvae:
- Collect sample of coloring fruit
- Place fruits in Ziploc bag
- Crush fruit lightly to break fruit
- Add salt-water mixture (4 cups water ¼ cup salt)
- Leave fruit in mixture for 1h
- Look for larvae floating in the liquid (eggs and smaller larvae difficult to detect)
Confirmation of SWD

To confirm that larvae in fruit are SWD:

- Collect damaged fruits
- Place fruits in Ziploc bag
- When adults emerge, place bag in freezer to stun flies
- ID flies or
- Transfer adults to container with rubbing alcohol
- Ship to: PJ Liesch
  Insect Diagnostic Lab
  Madison, WI 53706
SWD management

- No action threshold for SWD
- Relationship between trap catch and fruit infestation unknown
- If fruit are ripening and SWD flies are trapped:
  1. Increase monitoring intensity to assess fly distribution (check traps at least twice per week)
  2. Use cultural controls where possible
  3. Use registered insecticides from detection until harvest completed
SWD management

Cultural control: Minimize build up of SWD

• Remove native wild hosts (apples, plums, dogwood, honeysuckle, …)
• Schedule timely harvests
• Remove over-ripe fruit from field as soon as possible to minimize SWD egg lay and larval development
• Pickers with one container to collect good fruit and another to collect over-ripe fruit
Sanitation: Dispose off fruit

- Bag fruit inside plastic bag, seal, and solarize
- Place clear plastic sheeting over fruit in sunny location and seal around edge with soil (solarize)
- Collected fruits should be used, destroyed or buried

Do NOT compost infested fruit!

If bury fruit, at least 1 ft deep
Cultural control

Canopy and water management

• Prune plants to maintain an open canopy, less attractive to SWD and improve spray coverage
• Overhead irrigation should be minimized
• Allow ground and mulch surface to dry before irrigating
Cultural control

Netting

- May be useful to keep flies from attacking fruit
- Must be applied before fruit begins to ripen
- Must be secured at bottom so flies cannot enter
- Mesh size should be very small: 1/32” (1 mm) mesh
Chemical control

- Multiple generations, probably no distinct generations
- Continuous increase in activity once flies become active
- Spray intervals should be relatively short (4-5 days) to prevent crop infestation before and during harvest
## Chemical control

<table>
<thead>
<tr>
<th>Class (IRAC)</th>
<th>Trade name</th>
<th>Active ingredient</th>
<th>REI (hrs)</th>
<th>PHI (days)</th>
<th>Rate (per acre)</th>
<th>Probable efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbamates (1A)</td>
<td>Sevin</td>
<td>Carbaryl</td>
<td>12</td>
<td>7</td>
<td>1-2 quarts</td>
<td>Good (JB)</td>
</tr>
<tr>
<td></td>
<td>Lannate</td>
<td>Methomyl</td>
<td>48</td>
<td>3</td>
<td>¾-1 lbs</td>
<td>Excellent</td>
</tr>
<tr>
<td>Organophosphates (1B)</td>
<td>Malathion</td>
<td>Malathion</td>
<td>12</td>
<td>1-2</td>
<td>1.5 – 2 pints</td>
<td>Good/Excellent (JB)</td>
</tr>
<tr>
<td></td>
<td>Imidan</td>
<td>Phosmet</td>
<td>24</td>
<td>3</td>
<td>1.3 lb.</td>
<td>Excellent (JB)</td>
</tr>
<tr>
<td>Pyrethroids and Pyrethrins (3A)</td>
<td>Bifenture/Brigade</td>
<td>Bifenthrin</td>
<td>12</td>
<td>12hrs</td>
<td>8 – 16 oz.</td>
<td>Good/Excellent (JB)</td>
</tr>
<tr>
<td></td>
<td>Asana</td>
<td>esfenvalerate</td>
<td>12</td>
<td>7-14</td>
<td>4.8 – 9.6 fl. oz.</td>
<td>Excellent (JB)</td>
</tr>
<tr>
<td></td>
<td>Danitol</td>
<td>Fenpropathrin</td>
<td>24</td>
<td>2</td>
<td>10 ¾ – 21 ½ fl. oz.</td>
<td>Excellent (JB)</td>
</tr>
<tr>
<td></td>
<td>Mustang Max</td>
<td>zeta-cypermethrin</td>
<td>12</td>
<td>1</td>
<td>4 oz.</td>
<td>Excellent (JB)</td>
</tr>
<tr>
<td></td>
<td>Pyganic OMRI</td>
<td>Pyrethrum</td>
<td>12</td>
<td>12hrs</td>
<td>16 – 64 oz.</td>
<td>Good/Fair</td>
</tr>
<tr>
<td>Spinosyns (5)</td>
<td>Entrust OMRI</td>
<td>Spinosad</td>
<td>4</td>
<td>1</td>
<td>1.25 – 2 oz.</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Delegate</td>
<td>spinetoram</td>
<td>4</td>
<td>1-3</td>
<td>6 oz.</td>
<td>Excellent</td>
</tr>
<tr>
<td></td>
<td>Success</td>
<td>Spinosad</td>
<td>4</td>
<td>1</td>
<td>4 – 6 fl. oz.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radiant</td>
<td>Spinoteram</td>
<td>4</td>
<td>1</td>
<td>6 – 10 fl. oz.</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

Always read the label and follow the guidelines!!!
# Chemical control

<table>
<thead>
<tr>
<th>Product Name</th>
<th>EPA Reg. No.</th>
<th>Active Ingredient</th>
<th>Efficacy¹</th>
<th>Fruit Crops Labeled for Use One</th>
</tr>
</thead>
<tbody>
<tr>
<td>BONIDE CAPTAIN JACK’S DEAD BUG BREW FLOWER &amp; VEGETABLE GARDEN DUST</td>
<td>4-479</td>
<td>Spinosad</td>
<td>Very good</td>
<td>apricots, cherries, nectarines, peaches, plums, prunes, bushberries and caneberry</td>
</tr>
<tr>
<td>BONIDE CAPTAIN JACK’S DEAD BUG BREW CONCENTRATE</td>
<td>4-471</td>
<td>Spinosad</td>
<td>Very good</td>
<td>apricots, cherries, nectarines, peaches, plums, prunes, bushberries and caneberry</td>
</tr>
<tr>
<td>BONIDE CAPTAIN JACK’S DEAD BUG BREW RTS</td>
<td>4-471</td>
<td>Spinosad</td>
<td>Very good</td>
<td>apricots, cherries, nectarines, peaches, plums, prunes, bushberries and caneberry</td>
</tr>
<tr>
<td>FERTI HOME BORER, BAGWORM, LEAFMINER &amp; TENT CATERPILLER SPRAY</td>
<td>62719-314-7461</td>
<td>Spinosad</td>
<td>Very good</td>
<td>apricots, cherries, nectarines, peaches, plums, prunes, and bushberries</td>
</tr>
<tr>
<td>BULLSEYE BIOINSECTICIDE</td>
<td>62719-314-56872</td>
<td>Spinosad</td>
<td>Very good</td>
<td>apricots, cherries, nectarines, peaches, plums, prunes, and bushberries</td>
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<tr>
<td>MONTEREY GARDEN INSECT SPRAY</td>
<td>62719-314-54705</td>
<td>Spinosad</td>
<td>Very good</td>
<td>apricots, cherries, nectarines, peaches, plums, prunes, and bushberries</td>
</tr>
<tr>
<td>PROTECTOR PRO</td>
<td>62719-314-87130</td>
<td>Spinosad</td>
<td>Very good</td>
<td>apricots, cherries, nectarines, peaches, plums, prunes, bushberries and caneberry</td>
</tr>
<tr>
<td>SPINOSAD 0.8% SC</td>
<td>62719-314</td>
<td>Spinosad</td>
<td>Very good</td>
<td>apricots, cherries, nectarines, peaches, plums, prunes, and bushberries</td>
</tr>
<tr>
<td>ORTHO BUG B Gon SYSTEMIC INSECT KILLER CONCENTRATE</td>
<td>8033-107-239</td>
<td>Acetamiprid</td>
<td>Good</td>
<td>apple, pear, apricot, cherry (sweet and tart), nectarine, peach, plum (chickasaw, damson, Japanese), plumcot, prune (fresh), grapes, strawberries and other low-growing berries, blueberries and other bush and caneberry.</td>
</tr>
<tr>
<td>ORTHO FLOWER FRUIT &amp; VEGETABLE INSECT KILLER CONCENTRATE</td>
<td>8033-107-239</td>
<td>Acetamiprid</td>
<td>Good</td>
<td>apple, pear, apricot, cherry (sweet and tart), nectarine, peach, plum (chickasaw, damson, Japanese), plumcot, prune (fresh), grapes, strawberries and other low-growing berries, blueberries and other bush and caneberry.</td>
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[1] Efficacy: Good, Very good

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http://www.fruit.cornell.edu/spottedwing/pdfs/SWDgarden.pdf

Other home gardener recommendation website from MN:
http://www.extension.umn.edu/garden/insects/find/spotted-wing-drosophila-in-home-gardens/
Organic production

- Organic insecticides less effective than conventional
- Require more timely application
- Cultural controls even more important
- Rotate Entrust (5 day residual) with Pyganic (2 day residual)

to achieve some resistance management
Post-harvest

Refrigeration

• Berries that have no visible damage should be placed directly in refrigerator

• Will slow down or stop SWD development if present, both hatched and unhatched

• Holding berries at 34F for 72 hrs will kill most eggs and larger larvae

• Freezing berries will kill SWD
UW SWD website

Please, visit website and make suggestions

http://labs.russell.wisc.edu/swd/
Questions?

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