Spotted-Wing Drosophila (SWD)

Male

Female

![Male Spotted-Wing Drosophila](image1.png)

![Female Spotted-Wing Drosophila](image2.png)

![Berries](image3.png)

![Blackberries](image4.png)
Life Cycle

10 – 15 Days

Bev Gerdeman, WSU

WSU

WSU
SWD Damage

Egg Laying

Larval Feeding
Insecticides mainly target adults

If fruit is already infested, surviving larvae will replace the adults
Crop Specific Spray Tables

Brambles (Blackberry and Raspberry)
Table 2. Examples of SWD-active insecticides for bramble (blackberry and raspberry) production. This is not an exhaustive list, and other formulations of these active ingredients or other active ingredients in these chemical classes may be similarly effective. **ALWAYS read and follow all instructions on the pesticide label; the information presented here does not substitute for label instructions.**

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Active Ingredient</th>
<th>Re-entry Interval</th>
<th>Preharvest Interval</th>
<th>Effectiveness&lt;sup&gt;A&lt;/sup&gt;</th>
<th>Application Restrictions</th>
<th>Maximum Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asana XL</td>
<td>Esfenvalerate</td>
<td>12 hrs</td>
<td>7 days</td>
<td>Excellent</td>
<td>Not specified</td>
<td>0.15 lb ai/acre per season</td>
</tr>
<tr>
<td>Brigade WSB</td>
<td>Bifenthrin</td>
<td>12 hrs</td>
<td>3 days</td>
<td>Excellent</td>
<td>1 post bloom</td>
<td>0.2 lb ai/acre per season</td>
</tr>
<tr>
<td>Danitol 2.4 EC</td>
<td>Fenpropathrin</td>
<td>24 hrs</td>
<td>3 days</td>
<td>Excellent</td>
<td>2 per season</td>
<td>0.6 lb ai/acre per season</td>
</tr>
<tr>
<td>Mustang Maxx</td>
<td>Zeta-cypermethrin</td>
<td>12 hrs</td>
<td>1 day</td>
<td>Excellent</td>
<td>Not specified</td>
<td>0.15 lb ai/acre per season</td>
</tr>
<tr>
<td>Bifenture 10DF</td>
<td>Bifenthrin</td>
<td>12 hrs</td>
<td>3 days</td>
<td>Good-Excellent</td>
<td>1 post bloom</td>
<td>0.2 lb ai/acre per season</td>
</tr>
<tr>
<td>Pyganic EC 5.0 II&lt;sup&gt;B&lt;/sup&gt;</td>
<td>Pyrethrins</td>
<td>12 hrs</td>
<td>0 days</td>
<td>Weak-Fair</td>
<td>10 per season</td>
<td>Not specified</td>
</tr>
</tbody>
</table>

**Spinosyns (IRAC activity group 5)**

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Active Ingredient</th>
<th>Re-entry Interval</th>
<th>Preharvest Interval</th>
<th>Effectiveness</th>
<th>Application Restrictions</th>
<th>Maximum Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delegate WG</td>
<td>Spinetoram</td>
<td>4 hrs</td>
<td>1 day</td>
<td>Good-Efficient</td>
<td>6 per year</td>
<td>0.305 lb ai/acre per year</td>
</tr>
<tr>
<td>Entrust SC&lt;sup&gt;B&lt;/sup&gt;</td>
<td>Spinosad</td>
<td>4 hrs</td>
<td>1 day</td>
<td>Good</td>
<td>6 per year</td>
<td>0.45 lb ai/acre per crop</td>
</tr>
<tr>
<td>Spintor 2SC</td>
<td>Spinosad</td>
<td>4 hrs</td>
<td>1 day</td>
<td>Good-Fair</td>
<td>6 per year</td>
<td>0.45 lb ai/acre per crop</td>
</tr>
</tbody>
</table>

**Organophosphates (IRAC activity group 1B)**

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Active Ingredient</th>
<th>Re-entry Interval</th>
<th>Preharvest Interval</th>
<th>Effectiveness</th>
<th>Application Restrictions</th>
<th>Maximum Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malathion 8 Flowable</td>
<td>Malathion</td>
<td>12 hrs</td>
<td>1 day</td>
<td>Good</td>
<td>3 per year</td>
<td>Not specified</td>
</tr>
</tbody>
</table>

**Carbamates (IRAC activity group 1A)**

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Active Ingredient</th>
<th>Re-entry Interval</th>
<th>Preharvest Interval</th>
<th>Effectiveness</th>
<th>Application Restrictions</th>
<th>Maximum Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevin XLR Plus</td>
<td>Carbaryl</td>
<td>12 hrs</td>
<td>7 days</td>
<td>Fair-Good</td>
<td>5 per year</td>
<td>10 quarts product/acre per year</td>
</tr>
</tbody>
</table>

<sup>A</sup>Efficacy rankings summarized by Rufus Isaacs at Michigan State University and determined by surveys of WERA-1021 SWD Coordinating Committee members.

<sup>B</sup>OMRI approved for use in organic production.

**ALWAYS read and follow all instructions on the insecticide label**
Spray Coverage

Dense foliage may block pesticide dispersion
Creating refuge for SWD?

Sharpe et al. (2017); Rice et al. (2017)
Spray Coverage

Adult SWD – higher activity levels in inner and lower plant canopy
• Is spray coverage important for SWD control?

• Demonstration trials

• Optimizing spray coverage?
  - Adjusting carrier water volume
  - Sprayer calibration
Laboratory Bioassays

Mustang Maxx

or

Water (Control)

Store-bought raspberries individually sprayed in fume hood
Laboratory Bioassays

High Droplet Concentration
4 fl. oz. MM per 50 gallons water

Low Droplet Concentration
4 fl. oz. MM per 100 gallons water
Laboratory Bioassays

Adjusted “sprayer” speed to create variation in spray coverage
Laboratory Bioassays

Two spray coverage treatments

High spray coverage (~85%)  
Low spray coverage (~20%)
Laboratory Bioassays

Hold 24 hours with treated raspberry
Results: Larval Infestation

With Mustang Maxx, less than 1 larvae per female
No difference between high and low spray coverage
Results: Adult Mortality

50 GPA

% Mortality + SE

CON  MM

High Spray Coverage (~85%)

100 GPA

% Mortality + SE

CON  MM

Low Spray Coverage (~21%)
Conclusions

Reduced spray coverage may not effectively control adult SWD populations
Is spray coverage important for SWD control?

- Demonstration trials
- Optimizing spray coverage?
  - Adjusting carrier water volume
  - Sprayer calibration
Spray cards deployed in inner and outer plant canopy at varying heights.
Demonstration Trials

Visualize spray coverage using pink foam-marker dye
Demonstration Trials

**Inner**
- 30 - 52%
- 40 - 51%
- 6 - 22%

**Outer**
- 60 - 85%
- 57 - 93%
- 11 - 25%

Reduced spray coverage in the inner / lower plant canopy (N=3 spray trials)
Demonstration Trials

Lowest spray coverage in canopy regions with highest SWD activity

Sub-lethal exposure levels $\rightarrow$ insecticide resistance?
✓ Is spray coverage important for SWD control?

✓ Demonstration Trials
  • Optimizing spray coverage?
    • Adjusting carrier water volume
      – Sprayer calibration
Optimizing Spray Coverage?

Increasing carrier water volume often improves spray coverage

Sharpe et al. (2017); Nansen et al. (2015).
Field Trials (2016 – 2018)

Airblast sprayer

Backpack

Airblast sprayer with two-sided row crop head

Raspberries and/or blackberries sprayed at **50 or 100 gallons per acre (GPA)**
Airblast / Backpack Sprayer

Higher coverage in outer and upper canopy

*Generally:* ⬆ carrier water volume
 ⬆ outer spray coverage
Most consistent improvements in the lower plant canopy
Improved spray coverage in inner/outer canopy and at 50/100 GPA application rate
Is spray coverage important for SWD control?

Demonstration trials

- Optimizing spray coverage?
  - Adjusting carrier water volume
  - Sprayer calibration
Measuring Spray Coverage

Ambient humidity can impact water sensitive spray cards
Phone apps available to analyze cards
Marker dye not water sensitive

Hamby lab will be conducting spray coverage evaluations in 2020
Troubleshooting Spray Coverage

Canopy management may improve spray penetration

Airblast 101 Handbook
Monitor environmental conditions
High wind contributes to pesticide drift
Troubleshooting Spray Coverage

Make sure air is directed into target plant canopy
Adjusting deflectors on airblast sprayer may help
Include adjuvants (e.g. spreader-stickers) to improve coverage
Troubleshooting Spray Coverage

Other factors may include ground speed, sprayer height, nozzle angle
For More Information

http://www.sprayers101.com

Free handbook available for download as a PDF or ebook
Lab website: hambylab.weebly.com
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Questions?