Spotted Wing Drosophila: A New Key Pest of Cherries and Other Stone Fruit

Elizabeth H. Beers
WSU Tree Fruit Research & Extension Center
1100 N. Western Ave.
Wenatchee, Washington

Lake Chelan Horticultural Day
Chelan High School, Chelan, WA
17 January, 2011 ☢ 1:00-1:30 pm
Bioclimatic model prediction for SWD
…and then came June

28 June, fieldman brings in a sample from an apple cider vinegar trap
4 male SWD confirmed
Now distributed into Europe, the Middle East and North America

- Russia 2009
- Turkey & Israel 2009
- Spain 2008
- Florida 2009
- California 2008
- Hawaii 1980
Where has SWD spread?

- Italy 2009
- Russia 2009
- Spain 2009
- France 2010

![SWD spread map](image-url)
Pest/Host range observations

- Cherry (sweet, sour)
- Peach/nectarine
- Plum/pluot
- Apricot
- Berries: blackberry, raspberry, blueberry, strawberry
- Grapes (may depend on cultivar)

Any fruit on the ground (damaged, rotting) – apples, pears, oranges, ???
Native/Non-Crop Hosts

• Oregon grape - *Mahonia*
• Black currant - *Ribes*
• Blue Elderberry – *Sambucus*
• Cherry laurel - *Prunus laurocerasus*
• Mulberry – *Morus spp.*

*Other suspects:*
• Serviceberry - *Amelanchier*
• Chokechery - *Prunus virginiana*
**D. suzukii**, spotted wing *Drosophila*, SWD

**Identification**

Adults are 2-3 mm in size. Females and their larvae can be confused with other *Drosophila* but are larger.
D. suzukii

Female identification

our problem

Primary characters: size, colour, a darkly toothed and lengthy saw-like ovipositor, unlike other Drosophila
Comparison of female characters

*Drosophila sp.*
Nearctic species are small size
Ovipositor soft, serrated
Otherwise similar

*D. suzukii*
Ovipositor long and heavily serrated, with many dark teeth
"D. suzukii"

Male identification

Primary characters: colour, eye, arista, wing spot, comb alignment and dark bands on forelegs
SWD life history

• Lifespan: adults, 21-66 days (summer generations)
• Eggs laid: 219 – 563 eggs/female
• Egg stage: 1-2.5 days
• Larvae: 3-13 days (3 instars)
• Pupa: 4-14 days
• Hatch to emergence 15 °C [59 °F]: 21-25 days
• Hatch to emergence 25 °C [77 °F]: 9-11 days
SWD 2010 Trap Catch
(Beers, Walsh traps)

% Positive Traps
Avg SWD/trap/week

100/SWD/trap/week
(n=12)

% Positive Traps
Avg SWD/trap/week

Mar Apr May Jun Jul Aug Sep Oct Nov Dec
SWD
Seasonal Trap totals

- **white** – no catch
- **blue** – 1 to 10
- **green** – 11-50
- **yellow** – 51-200
- **orange** – 200-500
- **red** – 500+
Average SWD by Crop

- Strawberry: 38
- Raspberry/Blackberry: 1,015
- Plum/Pluot: 46
- Pear: 15
- Peach/Nectarine: 444
- Packinghouse: 26
- Grape: 1,554
- Cherry: 3,016
- Blueberry: 513
- Apricot: 209
- Apple: 65

Average SWD/trap (seasonal)
Average SWD by Region

No. samples

- Yakima: 14
- Wenatchee: 254
- Walla Walla: 5
- TriCities: 1,160
- Tonasket: 62
- Royal City: 82
- Rattlesnake: 57
- Quincy: 483
- Prosser: 2,417
- Othello: 35
- Orondo: 1,487
- Moses Lake: 24
- Mattawa: 643
- Chelan/Manson: 99
- Brewster: 119

Average SWD/trap (seasonal)
SWD distribution
I-90 north, south

Avg. SWD/trap/week

I-90 North: 14.7
I-90 South: 6.2

2,274 samples
4,667 samples
South to North: OR, BC, WA

*Contech traps corrected to Deli numbers
Trap Types

White sticky card

Deli cup

Contech

Nalgene

Yogurt container

McPhail
Trap types

<table>
<thead>
<tr>
<th>Trap Types</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWD/trap/week</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Deli</td>
<td>+41%</td>
<td>+32%</td>
<td>+38%</td>
</tr>
<tr>
<td>Contech</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E. Beers ©2011
Deli v Contech

1,000 ml vol.  200 ml vol.
100 ml bait    40 ml bait
First catch: Deli vs Contech

Deli earlier = 3
Contech earlier = 5
No difference = 6
Total = 14

*Avg. diff = 0 weeks
Apple Cider Vinegar vs “Super Bait”

Super Bait:
Water (5.5 pt)
Red wine (cheap) - 32 fl oz
Apple cider vinegar - 3 fl oz
Molasses – 6 fl oz
Dishwashing liquid – 1 tsp

ACV vs SuperBait
(max catch=444)

Males Females Total
SWD/trap/week
0 5 10
15
20
25
ACV
SuperBait

ns

ns

a

b

E. Beers ©2011
SCRI - SWD

SCRI grant funded summer of 2010
OSU (lead); USDA (Corvallis); Univ. Calif
(Davis, Berkeley, Farm Advisors); WSU
(berries, tree fruits)
Objectives: Genomic studies, ecology,
phenology, host preferences, monitoring,
degree-day model, chemical control,
resistance, biological control, sanitation,
economics, impact/evaluation, outreach

Walton et al.: $5,758,980 (4.5 years)
Malathion ULV (Ultra-low volume) Test

- Residue on leaves:
  - 12% corrected mortality after 16 hours of exposure
  - 81% corrected mortality after about 2 days of exposure
  - (12% mortality in the untreated controls at 43 h)
SWD Field-Lab Bioassay (cherry leaves)
P. Shearer, MCAREC, Hood River, OR

% Mortality (41 h)

- **Organophosphate**
- **Pyrethroid**
- **Spinosyn**
- **Neonicotinoid**
- **Other**

<table>
<thead>
<tr>
<th>Product</th>
<th>% Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrust 80WP</td>
<td>100</td>
</tr>
<tr>
<td>Malathion 5EC</td>
<td>100</td>
</tr>
<tr>
<td>Delegate 25WG</td>
<td>100</td>
</tr>
<tr>
<td>Warrior II</td>
<td>100</td>
</tr>
<tr>
<td>Sevin XLR</td>
<td>80</td>
</tr>
<tr>
<td>Malathion 8F</td>
<td>60</td>
</tr>
<tr>
<td>Assail 70WP</td>
<td>50</td>
</tr>
<tr>
<td>Provado 1.6F</td>
<td>30</td>
</tr>
<tr>
<td>Check</td>
<td>0</td>
</tr>
</tbody>
</table>
SWD Field-Lab Bioassay (cherry fruit)
P. Shearer, MCARED, Hood River, OR

% Mortality

- Organophosphate
- Pyrethroid
- Spinosyn
- Neonicotinoid
- Other
SWD Field-lab bioassay (fruit, larval mortality)
P. Shearer, MCAREC

![Graph showing stages/replicate for different treatments: Eggs and adults in bars for Warrior II, Deleg 25WG, Sevin XLR, Entrust 80WP, Assail 70WP, Provado 1.6F, Malathion 5EC, Malathion 8F, and Check.](image)
SWD Field-Lab Bioassay (cherry leaves)
R. van Steenwyk, UC Berkeley, Tracy, CA

% of Best Treatment

- Organophosphate
- Pyrethroid
- Spinosyn
- Neonicotinoid
- Other

Malathion 5EC 3.75 pt
 Diazinon 50W 4 lb
 Danitol 2.4EC 21.33 oz
 Delegate 25WG 3 oz
 Entrust 80WP 2.5 oz
 Provado 1.6F 8 oz
 Pounce 25WP 12.8 oz
 Baythroid XL 2.8 oz
 Mustang 1.5 EW 4.3 oz
 Warrior II 2.56 oz
 Assail 30SG 8 oz
 Sevin XLR 2 qt
 Actara 25WDG 5.5 oz
Van Steenwyk Field test

Van Steenwyk, 2010

Drosophila/100 fruit (flotation)

- **4-spray**: Diazinon, Mustang, Danitol, Malathion
- **3-spray**: Mustang, Danitol, Malathion
- **2-spray**: Danitol, Malathion
- **1-spray**: Malathion

Harvest 7 June

17-May  31-May  14-Jun  28-Jun  12-Jul
Fruit Susceptibility – ‘Bing’
Jana Lee, USDA Corvallis
Postharvest test on cherries

![Bar chart showing the adult Drosophila/fruit for different treatments: Dimethoate 4 pt, Provado 8 fl oz, and Check. The chart indicates that Dimethoate and Provado are significantly different from the Check, but Provado is not significantly different from Dimethoate. The y-axis represents the number of adult Drosophila/fruit, and the x-axis represents the treatments.]

- Dimethoate 4 pt: b
- Provado 8 fl oz: ab
- Check: a
Postharvest test on cherries

![Bar graph showing the comparison between Adult Drosophila/fruit for Dimethoate 4 pt, Provado 8 fl oz, and Check.]

- **D. suzukii**
- **Drosophila spp.**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Adult Drosophila/fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimethoate 4 pt</td>
<td>a</td>
</tr>
<tr>
<td>Provado 8 fl oz</td>
<td>a, ab</td>
</tr>
<tr>
<td>Check</td>
<td>a</td>
</tr>
</tbody>
</table>

E. Beers ©2011
WSU resources for SWD

- Elizabeth Beers, WSU-TFREC, Wenatchee
- Doug Walsh, WSU-IAREC, Prosser
- Tim Smith, Chelan-Douglas-Okanogan Area Educator
- Gwen Hoheisel, Benton-Franklin Area Educator
- Mike Bush, Yakima County
What to do:

• Check WSU website for first trap catch in your region (or -- put traps out in in stone fruit orchards)

• If crop is susceptible (pink stage on cherry) and pest is present, begin fruit protection sprays (7-10 day intervals)

• Sprays may work better when applied on a regional (area-wide) scale – communicate with your neighbors

• 2011 recommendations will be posted at:
  • http://extension.wsu.edu/SWD
A huge

“Thank You!!”

to the Fieldmen of Eastern Washington

including, but not limited to:

Wilbur-Ellis
Northwest Wholesale
Quincy Farm Chemicals
Cascade Ag Distributing
Northwest IPM
Cascade IPM

http://jenny.tfrec.wsu.edu/opm
http://extension.wsu.edu/SWD