Drosophila suzukii
3 years experience in Switzerland

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Situation in 2011

Monitoring 2011

- Captures: No
- Yes

Damages

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Monitoring 2012

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Selectivity test for various models of monitoring traps (field) in 2012

- Aim: estimate the potential impact on the entomofauna
- Lure used: cider vinegar + water + (+ red wine) wetting agent

Table 1: Trap Description

<table>
<thead>
<tr>
<th>Trap Type</th>
<th>Volume (ml)</th>
<th>Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Droso-Trap</td>
<td>1300</td>
<td>3 lateral openings Ø 1.2 cm</td>
</tr>
<tr>
<td>McPhail</td>
<td>2600</td>
<td>1 basal opening Ø 4.5 cm</td>
</tr>
<tr>
<td>Sentomol</td>
<td>1000</td>
<td>12 lateral openings Ø 1 cm</td>
</tr>
<tr>
<td>Agroscope</td>
<td>1300</td>
<td>16 lateral openings Ø 3 mm</td>
</tr>
</tbody>
</table>
Selectivity test for various models of monitoring traps in cherry and raspberry in 2012

- Trap ACW completely selective for small insects (> 95% Drosophilidae)
- Droso Trap was improved by placing a net in front of the openings
Selectivity test 2013
Selectivity test 2013

% Drosophila for each trap

Drosophilidae effective catches

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Essai Drosotrap 2012 vs Drosotrap 2013

captures total, 6 semaines

Drosotrap 2012
Drosotrap 2013

captures total par semaine

Drosotrap 2012
Drosotrap 2013

captures total par lieu

Drosotrap 2012
Drosotrap 2013

sureau
viorne

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Effective catches (per crop) from April to October

- Cerise
- Fraise
- Myrtilles
- Raisin
- Rubus

Captures (Echelle Log)

harvest period
Control strategy
Lure comparison

**Crop:** Rubus sp.

**Period:** 29.8.-12.9.

**Trap:** ACW-trap 1,8dl, transparent,

**Layout:** randomized block design

Crop: Rubus sp.
Period: 29.8.-12.9.
Trap: ACW-trap 1,8dl, transparent,
Layout: randomized block design
Control strategy

Mass trapping, principle

Phase 1

Mass trapping

Phase 2

If catches or in the neighborhood

Phase 3

If catches in the plot

Autumn-Spring

If catches in the neighborhood

Only if necessary
Danger to attract SWD in the plot

Monitoring trapping

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## Different cases

### Situation 1: Damages → Economic losses

<table>
<thead>
<tr>
<th>County</th>
<th>Crop</th>
<th>Environnement</th>
<th>Mass trapping</th>
<th>Regular harvest</th>
<th>Sanitary measures</th>
<th>Damage intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucerne</td>
<td>Cherry net 1.3mm</td>
<td>Wood, Elderberry, plums</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>Weak, end of harvest</td>
</tr>
<tr>
<td>Lucerne</td>
<td>Plum Var. Tophit</td>
<td>Wood, cherry</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>Weak</td>
</tr>
<tr>
<td>Lucerne</td>
<td>Raspberry soilless tunnel</td>
<td>Wood, orchard, blueberry</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>Weak – damage on overripe fruits</td>
</tr>
<tr>
<td>Vaud</td>
<td>Strawberry HS tunnel</td>
<td>Summer raspberry</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>Weak</td>
</tr>
<tr>
<td>Tessin</td>
<td>Strawberry HS; Raspberry open field</td>
<td>Wood</td>
<td>Fraise :oui Framboise : non</td>
<td>yes</td>
<td>no</td>
<td>Strong</td>
</tr>
<tr>
<td>Berne*</td>
<td>Raspberry open field</td>
<td>Cherry, plums</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>Strong</td>
</tr>
</tbody>
</table>
### Different cases

**Situation 2 : Pest under control, weak damages**

<table>
<thead>
<tr>
<th>County</th>
<th>Crop</th>
<th>Environnement</th>
<th>Mass trapping</th>
<th>Regular harvest</th>
<th>Sanitary measures</th>
<th>Damage intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schwyz</td>
<td>Autumn raspberry</td>
<td>Meadows, cherry, hedges</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>Weak, under control</td>
</tr>
<tr>
<td>Lucerne</td>
<td>Autumn raspberry, blackberry</td>
<td>River, hedges, meadows</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>Weak, under control</td>
</tr>
<tr>
<td>Tessin</td>
<td>Grapes Merlot</td>
<td>Wood, river,</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>Weak, under control Early harvest</td>
</tr>
</tbody>
</table>
## Different cases

### Situation 3: No damages

<table>
<thead>
<tr>
<th>County</th>
<th>Crop</th>
<th>Environnement</th>
<th>Mass trapping</th>
<th>Regular harvest</th>
<th>Sanitary measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schwyz</td>
<td>Strawberry, raspberry, blueberry, minikiwi, cherry, plum</td>
<td>Prairies, champs, habitations</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Schwyz</td>
<td>Cherry, apricot, plum</td>
<td>Vergers cerise, prairies, forêt à 200m</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Schwyz</td>
<td>Raspberry</td>
<td>Vergers cerise, bosquets</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Valais</td>
<td>Blackberry, tunnel</td>
<td>Fraise, framboise été, vergers cerise</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Grison</td>
<td>Raspberry, blackberry, strawberry, blueberry, goosberry</td>
<td>?</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Malgré des populations de *D. suzukii* importantes (nombreuses captures dans les pièges situés dans les cultures) des dégâts n’ont pas été observés.

- Le piégeage de masse a été mise en place dès la détection du ravageur
- Les récoltes ont été régulières
- Les mesures d’hygiènes ont été respectées
Control strategy

Control method:

- Weekly 50 fruits in the freezer
- Larvae come on the fruit surface!
Control, raspberry freeze / salted water

Freezing doesn’t work for bigger fruits (strawberry, plums...)

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Sanitary: important

- Short interval between 2 yields
- Over mature fruits away
- Nothing on the ground

Gärung destruction without oxygen
Control strategy parasitism

• Parasitism:
  
  • Japan:
    • *Asabara japonica* (Ideo, 2008) but still damages in cherry and blueberry (Tamada, 2009; Kanzawa, 1939)

  • Europe:
    • *Trichopria drosophilae* (trial in France in greenhouse with artificial inoculation)
Trials 2013-2014

- Repulsive plants in tunnels (*Ocimum kilimanscharicum*, *Geranium sp.*)
- Evaluation of mass trapping efficiency with / without sanitary measures (new traps in test)
- Study of the interaction *D. suzukii* / indigenous Drosophila (lab, cultures)
- Study of wintering: places, resistance, physiological state... (lab, nature)
Conclusions Monitoring / Survey

• Trap must catch the 1st SWD

• Find the » right crop « (Cherry / Rubus / wild berry)

• Price must not be a decision factor: it can be expensive

• By the 1st catch, communication on control with traps / sanitary measures

• Coordination at national level

• Private gardens / self-picking! Big reservoirs
Conclusions Mass Trapping / Control

- Trap must be efficient and cheap
- Small garden / big surface
- Price is a decision factor
- Maniability (round bottom / change the liquid)
- **Traps to be set as soon as the 1st catches occurs in the monitoring trap**
- Lure must last 3 weeks (change just once in the berry)
- Trap line between hedge (wild berry) and crop
- Sanitary measures must be combined with mass trapping
- Conservation to 2°C during 4 days reduces / stops the development (fruit quality???)
Conclusions Ecology SWD

- Shady areas
- Humidity (needs water / dies in 24hrs without water)
- Activity reduced when higher Temperatures (30°C), heavy rains and winds > 14 km/h
- Can resist to colder temperatures (catches at 1500m / with 5°C in 1100m: still activity)
- No evidence of varietal preference in strawberry (France)
- Parasitism still not efficient
Questions / problems unsolved

• Percent of overwintering population / imported fruits

• Overwintering: gravid females mostly // importance and danger of early crops in heated greenhouses

• Competition with indigenous Drosophila

• How long to a stabilisation of the population?

• Lack of trials with control on farm

• Communication (balance between producers / consumers)
Vielen Dank, merci beaucoup!!!