

An innovative approach for the management of spotted wing drosophila (*Drosophila suzukii*): improve crop protection using an environmentally friendly formulation



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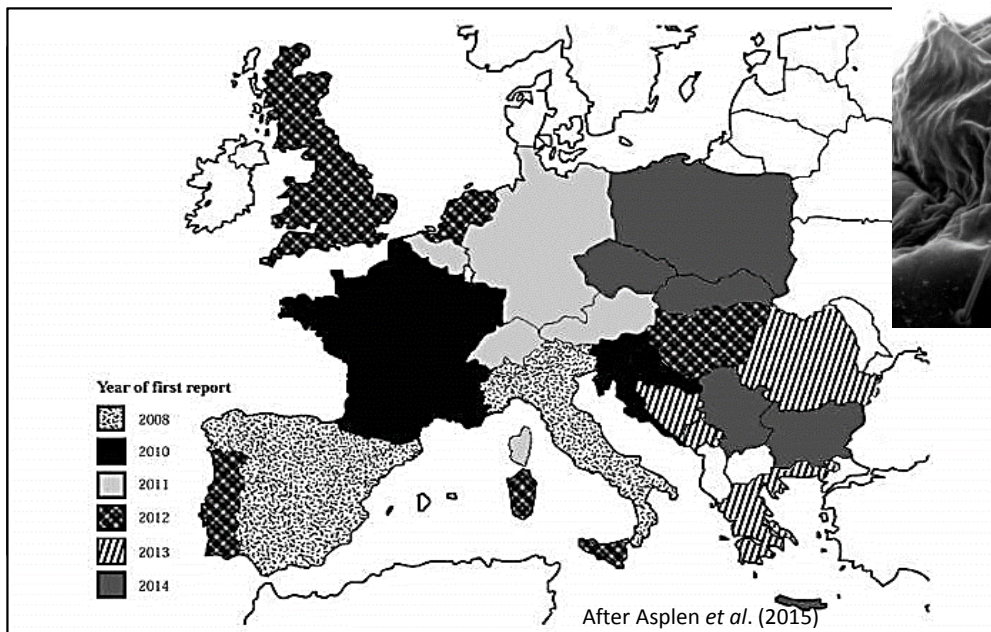


European PhD Network “Insect Science” – 16 November 2017

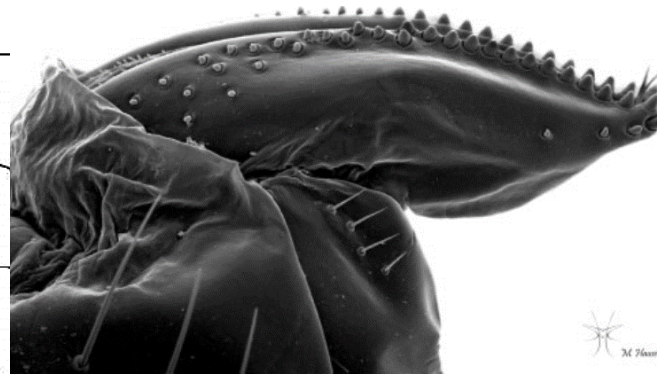
Introduction



Pest insect arrival: ideal climate
and adaptability



Rapid spread of *D. suzukii*





Damages and host range of *D. suzukii*



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Insecticides:
crucial for
**Preharvest
Interval**

Farmer
pressure to
have an
**alternative
control
method**

Economic damages

2010: € 500.000 (Trentino, Italy)

2011: € 3.000.000 (Trentino, Italy)

2011: € 550.000.000 (USA)

Reference: Cini *et al.*, 2012

Irene Castellan - UniBz - PhD Network Insect Science

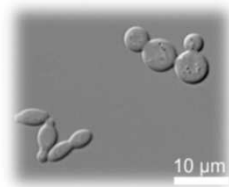
Research project aims



Need of an interdisciplinary approach: **CHEMICAL ECOLOGY**

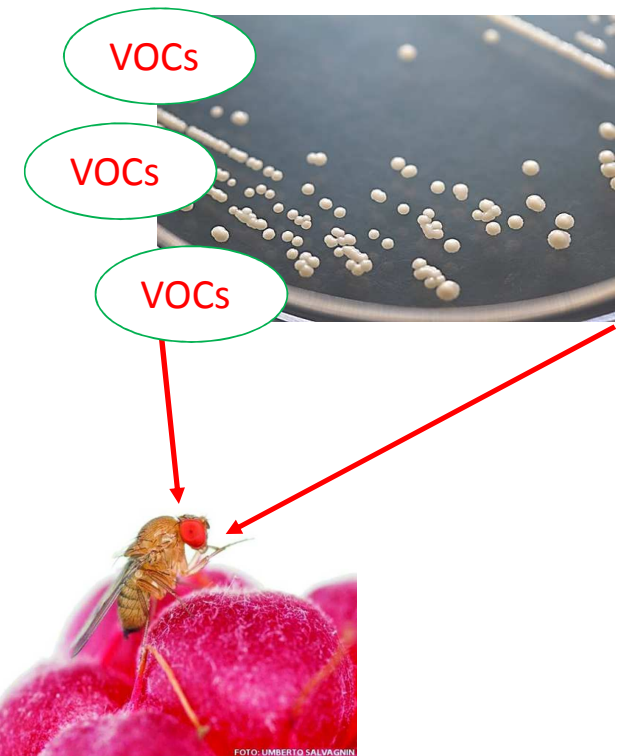
- Employing chemical, electrophysiological, and behavioural analyses

➔ Provide a comprehensive portrait of the **olfactory interactions** between yeasts and *D. suzukii*



Why targeting yeasts?

- Test their effects on SWD – known to be interacting with *Drosophila* species
- Flies recognize yeasts based on the rich repertoire of **volatile organic compounds (VOCs)**



Facilities



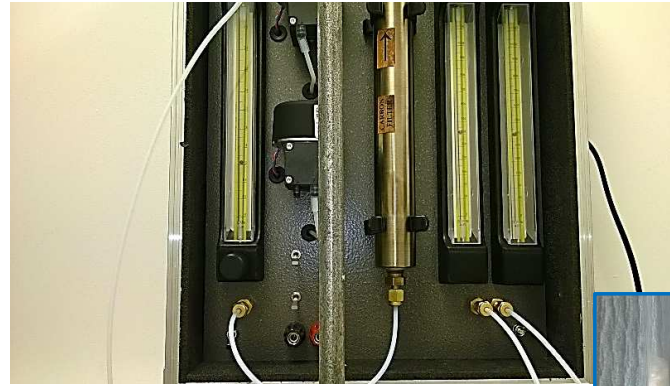
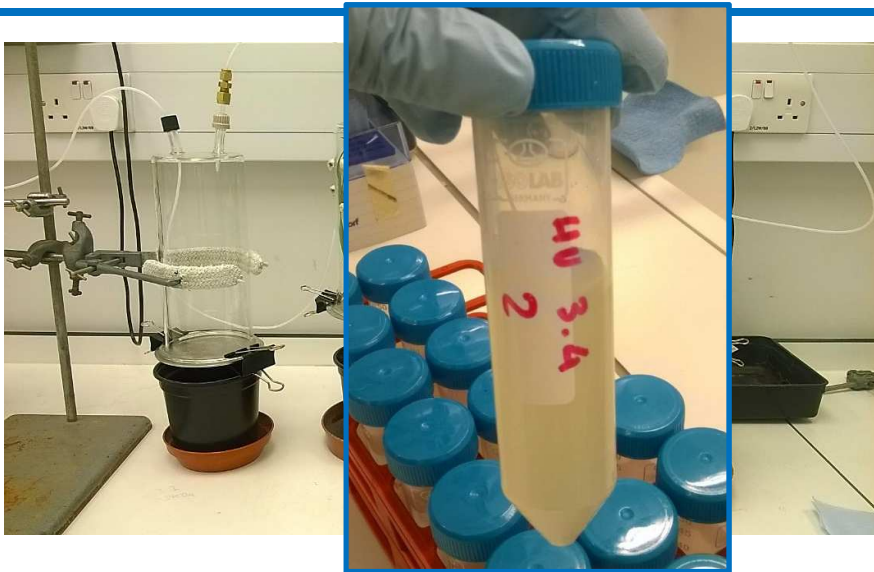
- Laboratories in UniBz
 - Volatiles extraction
 - Gas Chromatography
 - Electroantennography



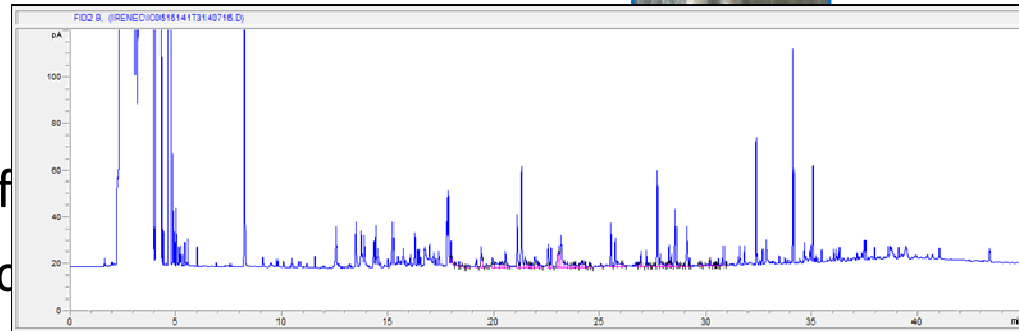
- Laimburg Research Centre
 - Preparation of Yeast cultures
 - Field trials



Yeast volatiles extraction and analysis



Example: **Air
Entrainment
technique**



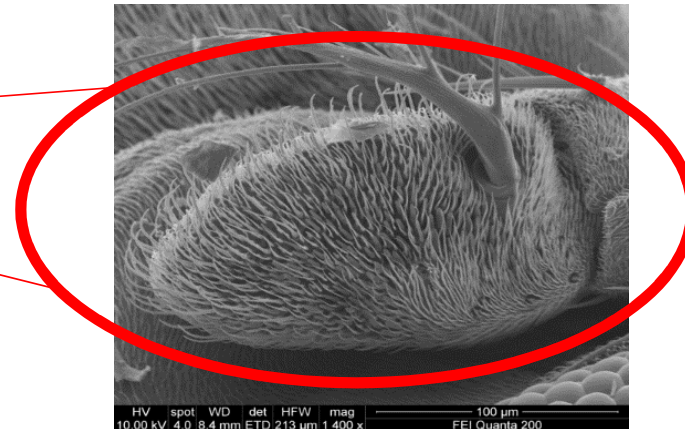
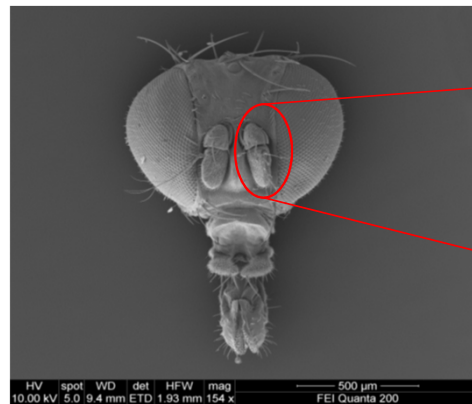
- Chemically analyse the VOC profile of
- Headspace analysis: static or dynamic
- Expected outcome: reveal quantitative and qualitative differences among strains

Coupled gas chromatography-electrophysiology

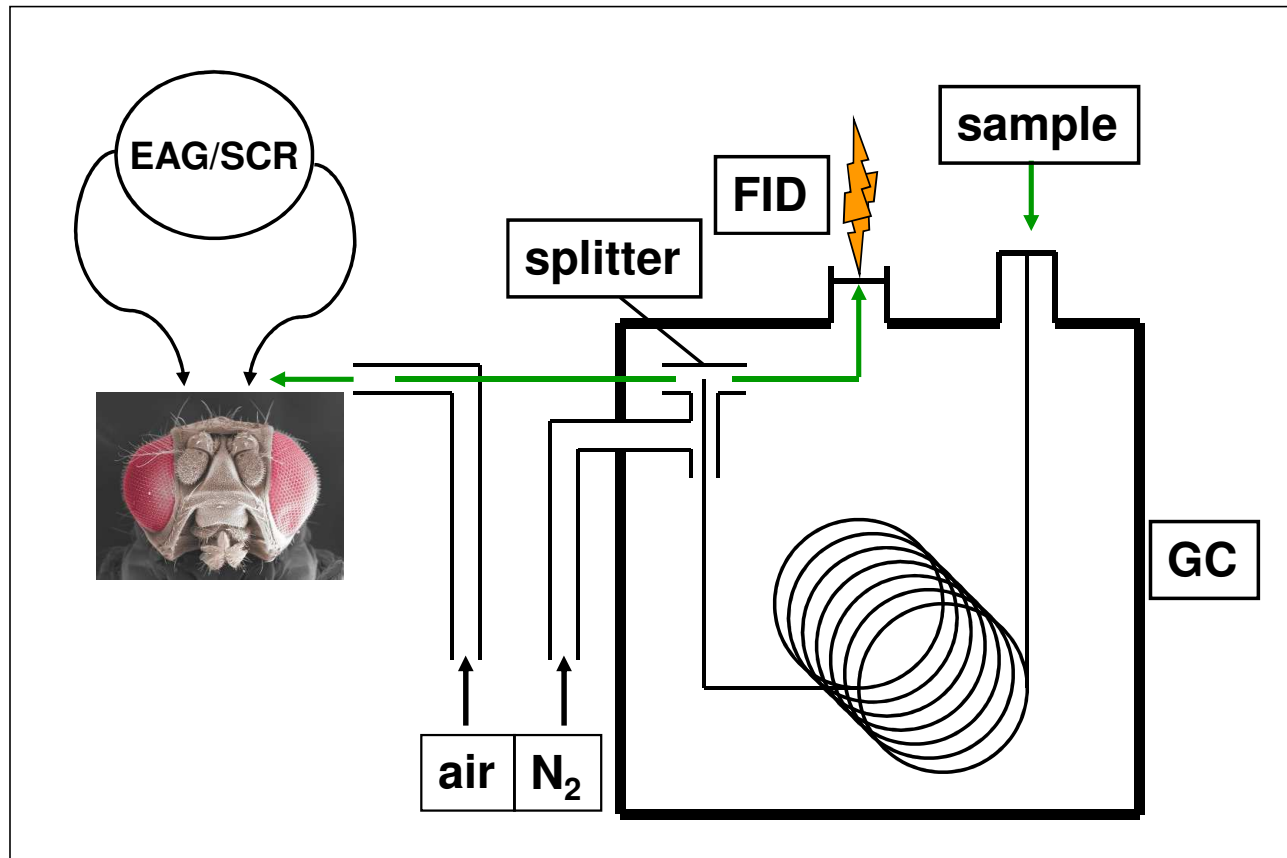


- Isolate and identify the physiologically active constituents from yeast VOCs that potentially define attraction\repulsion to *D. suzukii*
- *D. suzukii* antennae bear **olfactory sensilla**: electrophysical responses indicate that are used in chemoreception or gustation

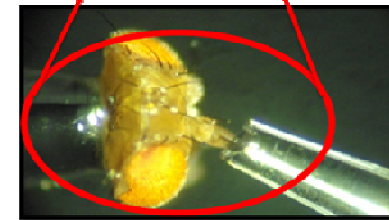
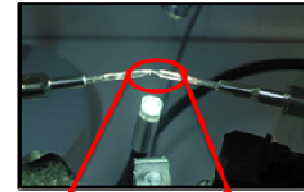
In EAG we measure the sum of all sensilla responses of the antenna



Coupled gas chromatography-electrophysiology

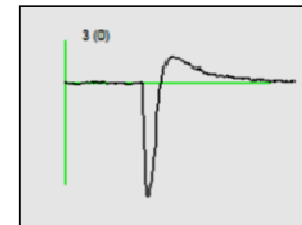
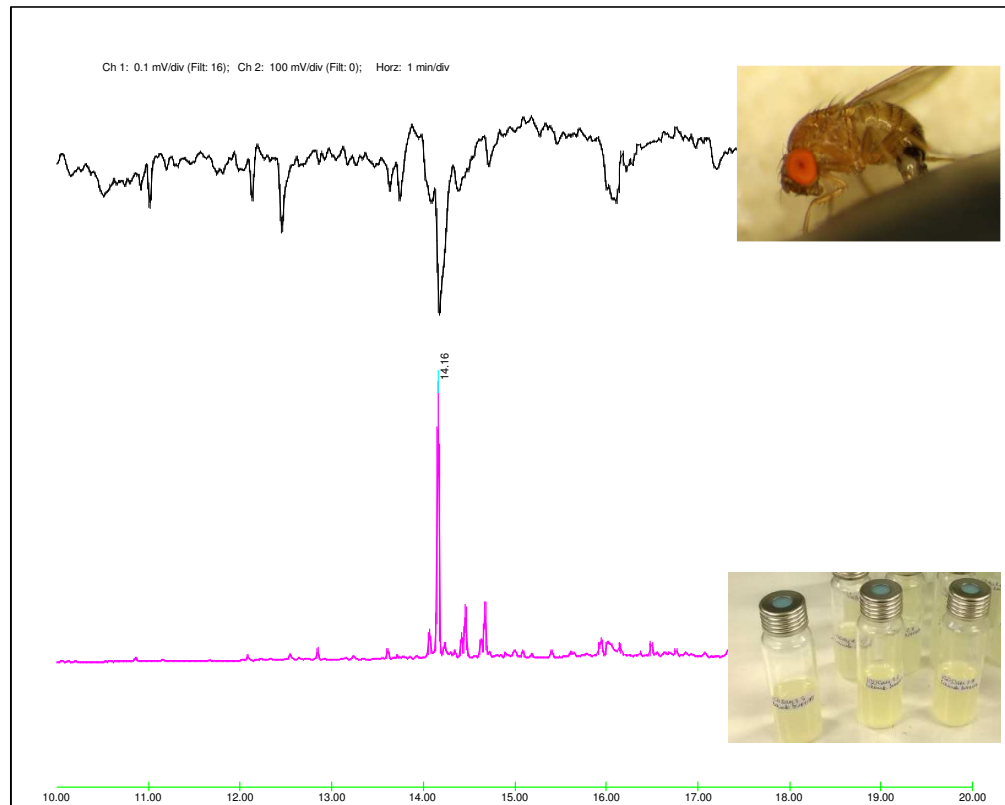


- *D. sukuzii* adults
- Head excised

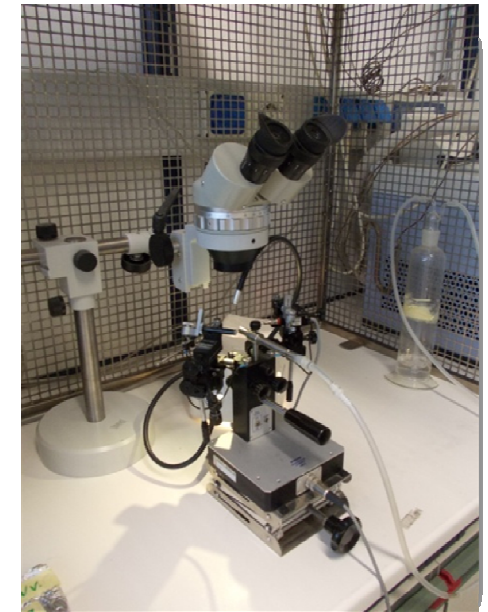


Stimulus
delivered on
the antenna:
immediate
response in the
chromatogram
peaks

Coupled gas chromatography-electrophysiology



Measures
intensity of
antennal
perception



Expected outcomes



- Select an attractive **yeast bait** to target *D. suzukii* on a selected surface
- Identify a **phagostimulant** component: keep the insect on the chosen surface
- Define an **insecticide additional component** to integrate the attractive system
- Develop an ideal method to apply in the open field: **environmentally friendly formulation**

Evaluate the field performance of **attract & kill** system and optimize it.



Acknowledgements



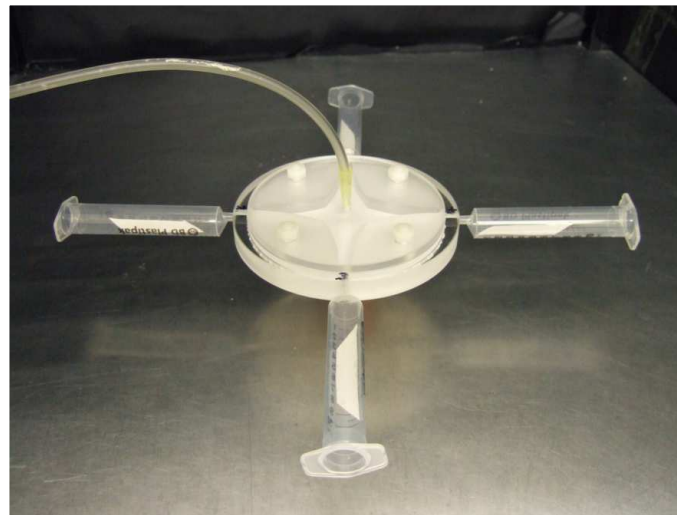
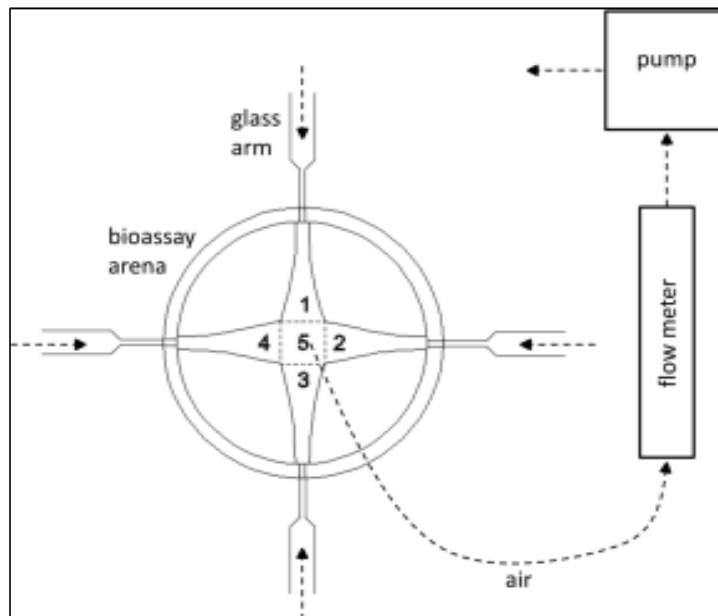
- Prof. Sergio Angeli (UniBz)
- Dott. Silvia Schmidt (Laimburg Research Centre)
- Research Staff



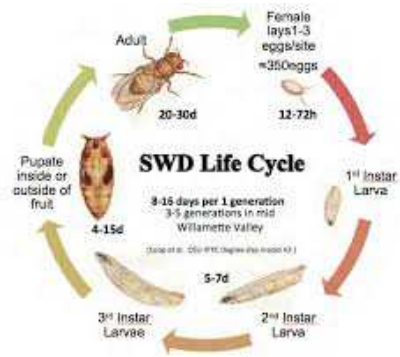
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Bioassay-guided identification of semiochemicals: olfactometry



Additional



Spotted Wing *Drosophila* (*Drosophila suzukii*) has an ovipositor that enables it to pierce the skin of healthy fruit still attached to the plant.



Drosophila suzukii ovipositor

- Spines black - color intensity increased sclerotization or hardness
- Largest spine located at tip of ovipositor; punctures the skin of the fruit, allowing insertion of the ovipositor.

Non-*suzukii* ovipositor

- Blunt tip of ovipositor
- Spines not blackened - less hardened or sclerotized
- Cannot pierce skin of healthy fruit

