Identification of volatiles released by fruit-associated yeasts for the specific attraction of *Drosophila suzukii* in the field

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Relevance of the Thesis

Research background

• Chemical control of *Drosophila suzukii* (Matsumura) (Diptera: Drosophilidae) using synthetic insecticides is particularly challenging as it is difficult to respect pre-harvest intervals. This pest has spread in the United States, and many European countries including Italy
• Applications within chemical ecology allow us to develop a different approach to tackle the problems caused by *D. suzukii*, modifying the insect’s behaviour in response to volatiles
• Fruit-associated yeasts are already known to be interacting with *D. suzukii* thanks to their volatile organic compounds (VOCs).

Research aims

• Culture eight yeast strains, previously selected as found to be fruit-associated
• Characterise the volatile profiles of each living yeast culture using direct headspace analysis and gas chromatography-mass spectrometry (DHS-GC-MS)
• Identify the volatiles emitted by each strain, and detect possible differences between them.

*Hanseniaspora uvarum* (left) and *Saccharomyces cerevisiae* (right) cells growing. Photo courtesy by D. Nordmann (2015), Genetik Universität Osnabrück. VOCs emitted by yeasts likely perceived by *D. suzukii* antenna.
Main Results

We characterised 16 VOCs in total. PDB was a better medium than YMM, and was therefore selected to carry on the cultures. The chromatograms resulting from the GC-MS analysis showed a higher number and intensity of volatile compounds when the yeast strains were cultured in the nutrient-rich medium PDB.

Pictured on the right are the chromatograms of the strains emitting most of the volatiles identified. We characterised the detected volatiles using Chemstation software (Agilent), then we performed a statistical analysis (ANOVA) to determine the significance of our data. R software was used for the statistics. Results showed that the strains Candida sp. 3.3 and Hanseniaspora uvarum 1.21 release many acetates and almost no alcohols. The strain Saccharomyces vini 1.23 instead, showed a high emission of one acetate and some alcohols, but no esters. H. uvarum strains do not seem to produce much, but the acetates emitted could be of some significance in terms of attraction towards Drosophila suzukii.
Impact and Prospectum

- The outcome of our experiments revealed that there are indeed differences among the yeast strains that we selected and analysed: no one was identical to another.

- The most promising yeast seems to be *S. vini* 1.23, as it is the only strain releasing a monoterpene.

- According to the results, we would like to use yeasts to specifically target the oviposing females of *D. suzukii*.

- It is likely that the pest insect might respond differently to these strains, since they are fruit-associated, and probably they will be attracted or repelled by the detected volatiles. More trials are currently under assessment for the volatiles’ characterisation.

- Future experiments involve behavioural bioassays utilizing the Pettersson 4-way-olfactometer, electroantennography and field experiments to test the yeast volatiles.
Thank You

Get in Touch
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