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# BOOK OF ABSTRACTS

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# Open-field vibrational mating disruption: the effect on leafhopper pests and the vineyard ecosystem

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**Highlights**

- For the first time, the vibrational mating disruption method has been applied to an experimental vineyard in Italy
- The experimental vineyard will be monitored to test the vibrational mating disruption method in an open-field trial through two following season
- The open-field trial will permit to assess the efficacy and potential side effects of the vibrational mating disruption method

## Introduction

Recently, the vibrational mating disruption method is taking relevance as a sustainable alternative to pesticides to control populations of pests that rely on vibrations to mate, such as leafhoppers (Polajnar et al., 2015). Since 2012, when the method was first proved to reduce *Scaphoideus titanus* mating in semi-field conditions (Eriksson et al., 2012), other leafhopper pests have been studied to decode and disrupt their signals. Nevertheless, a practical pest management application is still missing.

To definitively test the applicability and efficacy of the method an open-field trial is required. The setup of a 'vibrational vineyard' will enable us to assess the efficacy of the method to reduce two co-occurring leafhopper species populations (*S. titanus* and *Empoasca vitis*), while evaluating the potential side-effects on beneficial arthropods, which are known to use vibrations to detect their preys and hosts (Virant-Doberlet et al., 2011).

## Material and methods

A disruptive signal (DS) capable to disrupt the mating communication of both *E. vitis* and *S. titanus* has been synthetised thanks to laboratory trials.

The experimental 'vibrational vineyard' has been set up at the Fondazione Mach, Italy. The chosen vineyard (Cabernet Franc, spurred cordon trained, year of installation 2002-2004) has been divided in two plots of about 1 ha each (i.e. treated and control plot). In the treated plot, the DS has been transmitted to the plants by means of electro-magnetic shakers attached to the poles of each row. Shakers were positioned 25 m from the end of each row and 50 m from the following shaker. The DS was transmitted to the plants throughout summer 2017 (i.e., treatment period). The signal emission quality of each shaker has been tested by means of a laser vibrometer every two week during the treatment period.

To test the efficacy of the mating disruption method leafhoppers were manually sampled by surveying 25 plants (20 leaves per plant) per plot. The sampling was conducted weekly, before applying the DS (from May 9$^{th}$ to July) to assess the initial population density, and continued until the end of September. Females of *E. vitis* and *S. titanus* were isolated to check whether they laid fertile eggs or not. The potential side effects on beneficial arthropods have been monitored (May 9th - end of September) by assessing the population trend of spiders and parasitoids.

## Results and discussion

Until now, the vibrational mating disruption method has been tested only in semi-field conditions. Thus, an appropriate evaluation of the ecological impact was not feasible. We managed to set up a 'vibrational vineyard' (vibrated plants on a continuous surface of about 1 ha) to verify the efficacy of the method on leafhopper populations and its impact on other non-target species, either pests or not. Some beneficial arthropods, such as parasitoids and spiders that are known to contribute in controlling leafhopper populations, use vibrations to detect their preys (Virant-Doberlet et al., 2011), therefore they were also monitored. Vibrational noises, both natural and anthropogenic, can affect spiders prey detection. However, it has never been tested what happens applying to a large surface, such as a vineyard, a DS tuned on the frequencies used by leafhoppers to communicate. If the predatory activity of spiders and parasitoids will be reduced by the DS transmission, the control of leafhopper populations will be totally dependent on the efficacy of the vibrational mating disruption method. Otherwise, the vibrational method could work in synergy with other integrated pest management resources.

The set up will be maintained and activated throughout two following seasons, summer 2017 and 2018. Thus, the efficacy to reduce the population of leafhoppers of the vibrational mating disruption method will be tested during and after one full summer of treatment (i.e., summer 2017-2018 and spring 2018). A first assessment of the method efficacy will be done by measuring the *S. titanus* population density in the spring following the year of treatment.

In conclusion, the 'vibrational vineyard' will enable us to perform open-field studies that will give important answers about the applicability and the ecological impact of the vibrational mating disruption method in a commercial vineyard and its agro-ecosystem.

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## References

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