

VIBRATIONAL SIGNALS AS SEMIOPHYSICALS: A COMPARISON BETWEEN PHEROMONAL AND VIBRATIONAL MATING DISRUPTION

Valerio MAZZONI¹, Rachele NIERI², Gianfranco ANFORA^{1,3}, Anna E ERIKSSON¹, Jernej POLAJNAR⁴, Meta VIRANT-DOBERLET⁴, Andrea LUCCHI⁵

¹Research and Innovation Centre, Fondazione Edmund Mach, San Michele all'Adige (TN), Italy

²North Willamette Research and Extension Center, Oregon State University, United States

³Center of Agriculture Food Environment (C3A), University of Trento, San Michele all'Adige, Italy

⁴Department of Organisms and Ecosystems Research, National Institute of Biology, Ljubljana, Slovenia

⁵Department of Agriculture, Food and Environment, University of Pisa, Pisa, Italy

Until a few years ago, the concept of mating disruption had been exclusively associated with the use of pheromones to reduce population density of insect pests. Since the early 2000s, a novel approach has been proposed to the scientific community: vibrational mating disruption (VMD). The novelty is the use of disturbance vibrations to disrupt the mating behavior of insect pests that communicate by means of substrate borne vibrations. This research falls within the new field of biotremology and it brought the VMD from a theoretical concept to practical open field experimentation: in 2017, VMD was applied in an organic vineyard in Northern Italy to control leafhopper pests' population density. In 2018 other two vibrational vineyards have been established.

These achievements gave us the opportunity to report the state of the field for the method, to discuss the ongoing research and to make a comparison between pheromone mating disruption (PMD) and VMD. We discuss VMD characteristics and we provide a benchmark, using as reference the traditional PMD to discuss similarities and differences. We analyze advantages and disadvantages of applying VMD to commercial crops and we introduce the novel term of "semiophysicals" for vibrational signals to underline their similarity, in terms of functions, with "semiochemicals".

The field VMD experiments conducted starting from 2017 and 2018 will require a long observation period, during which we will work on technological and methodological improvements and perform constant monitoring of insects and plants. In this regard, the half century of experience with PMD could be an essential source of information to boost VMD advancement.