

Vibrational signals to control the whitefly in organic greenhouse production

Problem

The greenhouse whitefly *Trialeurodes vaporariorum* is a major pest in many crops, including tomato and zucchini. Mineral oils are currently used against this insect and need to be replaced with more sustainable solutions.

Solution

Whiteflies communicate with vibrational signals for mating. Understanding vibrational communication can help develop behavioural manipulation techniques to control the population of whiteflies in greenhouses.

Outcome

Vibrational plates (Vibro-plates) were built to transmit specific disruptive vibrations to the whiteflies via potted tomato and zucchini plants. The combined use of vibrations and essential oils resulted in a reduction of the whitefly populations. The prototype is versatile and can be customised for different crop systems.

Applicability box

Input used

- | | |
|--------------------------------------|--|
| <input type="checkbox"/> Copper | <input type="checkbox"/> Anthelmintics |
| × Mineral oil | <input type="checkbox"/> Antibiotics |
| <input type="checkbox"/> Fertilisers | <input type="checkbox"/> Vitamins |

Geographical coverage

Global

Application time

Throughout entire cropping season

Period of impact

Current crop

Equipment

Vibro-plates

Best in

Tomato and other greenhouse crops

Practical recommendations

Features of the device

The Vibro-plate consists of a square plate made of wood (side length: 20 cm, thickness: 1 cm). The plate is covered with a plastic layer making it waterproof and preventing damage from plant watering. An electrically powered (12V) mini-shaker (model Tremos, CBC-Biogard) is placed in the centre at the bottom of the plate. The emission of the disruptive signal is produced by a microchip installed inside the mini-shaker. The designed prototype can easily be used in the greenhouse thanks to its versatility. The plate dimension can be modified and adapted to the bench size of potted plants while the mini-shaker can be applied to metallic wires for the plants grown in soil.

Use of the device

- The plants can be placed individually on the plate or in groups on a larger board (made of wood, plastic or polystyrene).
- The Vibro-plate is connected to the standard electric outlets usually available in greenhouses. The device must be turned on for the entire period when crop protection is needed (24 hours a day) to be effective.
- For crops that use wires as a part of a trellis system, the disruptive signal can be spread through metallic wires connected to the mini-shaker of the Vibro-plate.
- Vibrations dissipate with the distance travelled. It is crucial to have an adequate number of mini-shakers per unit of surface to keep disruptive vibrations above a minimum threshold of intensity. On average, one Vibro-plate device protects a surface of about 5 m².
- Vibrations are transmitted constantly, while essential oils can only be sprayed in the presence of whitefly adults in the vegetation.



Picture 1: Vibro-plate is provided with 4 iron legs (h: 6.5 cm) and a mini-shaker is placed in the centre at the bottom of the plate (Photo: Valeria Fattoruso, Fondazione Edmund Mach)

Picture 2: Tomato plants placed on the Vibro-plate during experiments in a cage (Photo: Valeria Fattoruso, Fondazione Edmund Mach)

On-farm application

System approach

Vibrational signals used in synergy with essential oils (e.g., orange oil, clitoria) against whiteflies can be considered a suitable strategy for organic farming. The method is free of chemicals and does not release harmful residues into the environment. The construction of a vibratory device should be seen as a farm investment with multiple year's longevity and periodical maintenance.

Availability

The device can accommodate different cropping systems and is easy to install on-farm. However, the prototype is still under development at this stage. More trials will be conducted in 2021, both in the greenhouse and on the field, to optimise the technical settings. The aim is to provide a reliable on-farm solution. The device should be available for farmers at the end of 2022.

Further information

Further readings

Fattoruso, V. (2020). Behavioural manipulation as an alternative to the use of paraffin oil in greenhouse whitefly control. Available at https://relacs-project.eu/wp-content/uploads/2020/01/ifoameu_projects_relacs_news_story_fem_japan_final.pdf.

Weblinks

Check the [Farm Knowledge Platform](#) for more practical recommendations.

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RELACS: 'Replacement of Contentious Inputs in Organic Farming Systems' (RELACS) builds on results of previous research projects and takes far-advanced solutions forward. As a system approach to sustainable agriculture, organic farming aims to effectively manage ecological processes whilst lowering dependence on off-farm inputs. The RELACS partners will evaluate solutions to further reduce the use of external inputs and, if needed, develop and adopt cost-efficient and environmentally safe tools and technologies.

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