RELACS
IMPROVING INPUTS FOR ORGANIC FARMING

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Vibrations against invasive whiteflies in citrus orchards

Problem

The orange spiny whitefly *Aleurocanthus spiniferus* is a pest of many crops, especially citrus. Mineral oils are sometimes used to control the orange spiny whitefly and need to be replaced with more sustainable solutions.

Solution

Orange spiny whiteflies communicate with each other through vibrations. Disruptive vibrations can interfere with their communication and reduce their populations. This method is especially effective when combined with other plant protection strategies.

Outcome

A mini-shaker controlled by a microchip vibrates the wires connected to the citrus plants. In combination with essential oils/plant extracts, the application of vibrations effectively reduces populations of orange spiny whitefly.

Applicability box

Input used

☐ Copper	☐ Anthelmintics
× Mineral oil	☐ Antibiotics
☐ Fertilisers	☐ Vitamins

Geographical coverage
Mediterranean basin and other citrus-growing countries

Application time
During the cropping season

Period of impact
Actual crop

Equipment
Poles, wires, mini-shaker, essential oils/plant extracts

Best in
Young citrus crops

Practical recommendations

- Wires must touch the plants to transmit disruptive vibrations, which are better propagated through young and trimmed plants.
- Disruptive vibrations are effective if the distance between the mini-shakers does not exceed 50 meters. The poles carrying the mini-shakers are set at regular distances to ensure that the wire is under sufficient tension to guarantee an adequate vibration amplitude.
- The mini-shakers should be turned on at first signs of infestations, because whiteflies can mate without vibrational communication when population density is high, making mating disruption approaches ineffective.
- The simultaneous application of plant extracts/essential oils (e.g., *Clitoria ternatea* and orange essential oil) enhances the effects of the disruptive vibrations. It significantly affects the orange spiny whitefly, especially when population density is not yet high.
- The energy is supplied by solar panels connected to the mini-shaker by electric wires.
- The microchip of the mini-shaker can be programmed to transmit vibrations that target other pests which also rely on vibration signals.

Picture 1: The mini-shaker is connected to the pole, and wires are in contact with the plants (Photo: Sabina Avosani, CIHEAM-Bari).
Picture 2: Citrus plants are in direct contact with the wires that transmit the vibrations received from the pole and are powered by solar panels (Photo: Sabina Avosani, CIHEAM-Bari).

On-farm application

System approach

- Vibrations dissipate with distance. Therefore, it is important to install a sufficient number of mini-shakers and ensure signals are properly transmitted to the plants, for example, by tying stem and/or branches to the trellis wires.
- Vibrational signals used in synergy with essential oils/plant extracts can be considered a suitable strategy against orange spiny whitefly in organic citrus orchards. This method is free of chemicals and does not release harmful residues into the environment. Purchase and installation of vibratory devices should be seen as a farm investment for the long term, considering that periodical maintenance is required.

Further information

Further reading

RELACS New Story "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

RELACS Practice Abstract "Vibrational signals to control the whitefly in organic greenhouse production" available at: https://relacs-project.eu/wp-content/uploads/2022/04/RELACS_PA_09_Vibrations_CIHEAM_FEM_final.pdf

Weblinks

Check the Farm Knowledge Platform for more practical recommendations.

About this practice abstract and RELACS

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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.

Project website: www.relacs-project.eu

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