Young Scientists Meeting 2018, 14th - 16th November, Julius Kühn Institute, Braunschweig, Germany

NANO-PUSH - Development of nanofibers emitting insect repellents as part of innovative push-and-pull strategies for control of fruit tree phytoplasma vectors

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*supported by a grant of Cnpq/DAAD

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Introduction

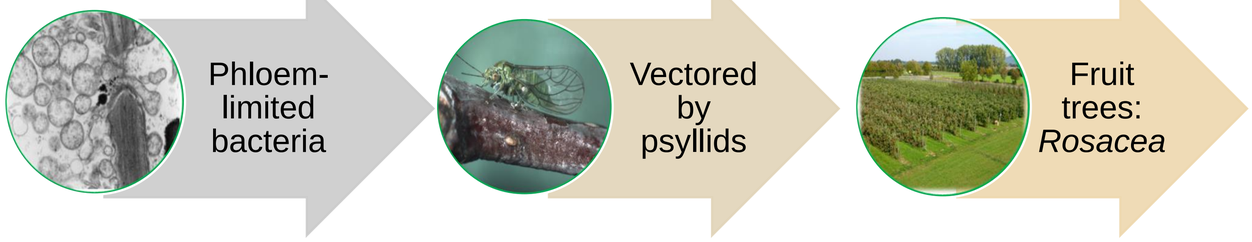
Insects of the genus *Cacopsylla* (formerly *Psylla*) are known as the major responsible vectors of fruit trees phytoplasmas. It was shown recently that they use chemical cues for orientation and host identification (Gross, 2016). To overcome the spreading of these diseases, especially the transition to healthy plants, several techniques using volatile substances that manipulate insect behavior like insects attractants and repellents have been identified. Furthermore, new systems for the delivery of volatile organic compounds (VOCs) are being studied to meet the requirements of plant protection measures in the field.

More recently, the nanotechnology offers great promises for delivery systems as an innovative tool. Nanofibers can be used to deliver both attractive compounds, and insect repellents. Through nanoencapsulation chemicals are slowly but efficiently released to a particular host plant for insect pest control (Ragaei & Sabry, 2014).

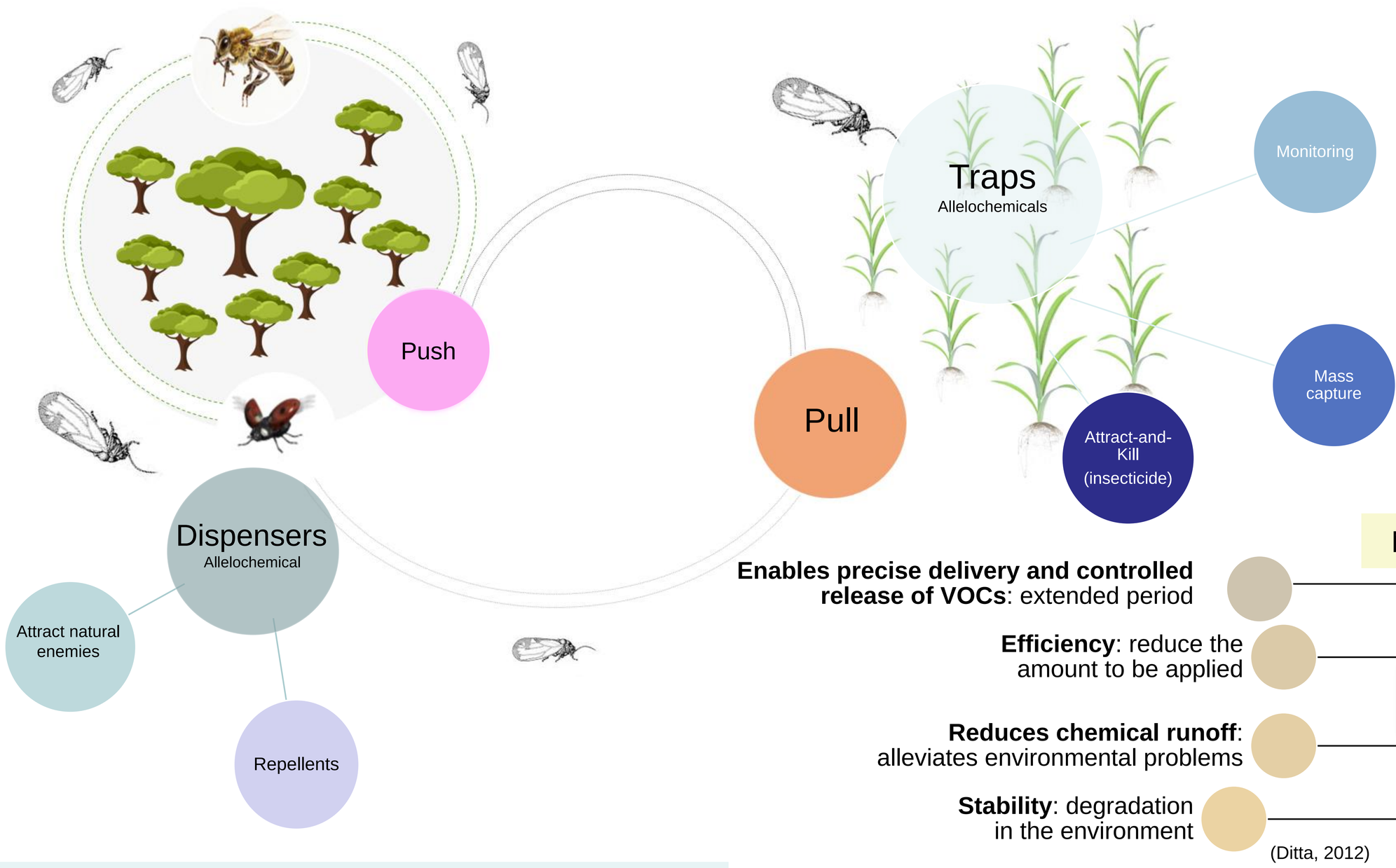
Objectives

- Identification of plant compounds repellent to target insects (*Cacopsylla* ssp.)
- Development of an innovative push-and-pull strategy
- Development of appropriate nanomaterial emitting repellent compounds.

Phytoplasma disease



Polymeric Nanofibers: Improvement of Push-and-Pull delivery system



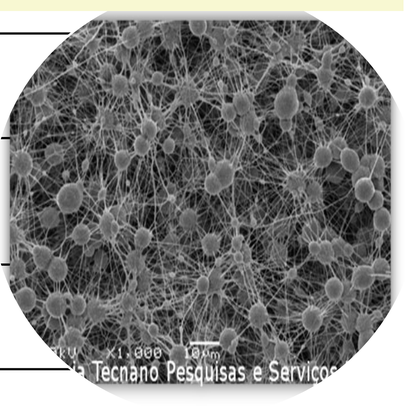
Nanoencapsulation

Enables precise delivery and controlled release of VOCs: extended period

Efficiency: reduce the amount to be applied

Reduces chemical runoff: alleviates environmental problems

Stability: degradation in the environment



(Ditta, 2012)

Expected Results

This combined application of an insect attractant (pull component) and repellent (push component) connected to a practical push-and-pull control method will reduce the use of chemical pesticides and ensure economic, sustainable and long term cultivation of pome and stone fruit in Germany and throughout Europe. Reducing chemical insecticides will decrease their effect on beneficial insects and the amount of CO_2 which will be released during production.

Compared to classical dispensers, nanoformulations for push-and-pull systems can improve formulations and as well increase volatiles longevity in in field conditions.

References: Ditta A 2012. How helpful is nanotechnology in agriculture?. *Advances in Natural Sciences: Nanoscience and Nanotechnology*, *3*(3); Gross J 2016. Chemical communication between phytopathogens, their host plants and vector insects and eavesdropping by natural enemies. *Front. Ecol. Evol.* 4:104; Ragaei M & Sabry AKH, 2014. Nanotechnology for insect pest control. *International journal of science, environment and technology*, *3*(2), 528-545;

https://doi.org/10.5073/20181026-084915

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