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

Bruna Czarnobai De Jorge and Jürgen Gross
Julius Kühn Institute, Institute for Plant Protection in Fruit Crops and Viticulture, Dossenheim
E-mail of corresponding author: bruna.czarnobai@julius-kuehn.de

Fruit trees of the family Rosaceae are seriously affected by phytoplasmas of the apple proliferation group. Phytoplasmas are pathogens of agriculturally important plants, including pears, apples, plums and citrus causing a wide variety of symptoms that range from mild yellowing to death of infected plants. Phytoplasma disease is caused by a group of specialized phloem-limited bacteria and are transmitted between plants, mainly, by insect vectors.

Some of these phytoplasmas are on the list of pests recommended for regulation by the European and Mediterranean Plant Protection Organization (EPPO), like 'Candidatus Phytoplasma mali', 'Ca. P. pyri', and 'Ca. P. prunorum' the most economically important disease in stone fruits, European Stone Fruit Yellows (ESFY) causing crop losses of infected peach and apricot trees.

Insects of the genus Cacopsylla (formerly Psylla) are known as the major responsible vectors and it was shown recently that they use chemical cues for orientation and host identification.

To overcome the spreading of this diseases, especially the transition to healthy plants, several techniques using volatile substances as insects attractive and repellents and also new system for the delivery of such substance are being studied.

Thus, 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.

This combined application of insect attractant (pull component) and repellents (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.

Nanoformulations for push-and-pull systems can prevent the migration and proliferation of psyllids in orchards, resulting in a strong reduction of new infections by phytoplasmas.

Systems for dispensing repellent substances in crop protection are without precedent and the use of nanotechnology in agrobiotechnological applications are in focus of the latest research.

The objective of this study is the development of an innovative push-and-pull strategy for the management of phytoplasma vectoring psyllids by using nanofibers for emitting repellent compounds.