

Greenresilient: Functional biodiversity with soil borne fungi to suppress greenhouse pests

Pests and diseases are often suppressed by various species of natural enemies and antagonists that naturally occur in cropping systems. Stimulating and conserving this functional biodiversity can be a way to increase the resilience of cropping systems.

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Entomopathogenic soil extraction experiment. Photo: Joop Woelke, 2018

Greenresilient is dedicated to study these principles to increase the resilience and sustainability of organic greenhouse cropping systems in Europe. Within this project, Wageningen University & Research is focussing on the role of beneficial microorganisms in the soil. Several strains of entomopathogenic fungi were successfully isolated from five organic greenhouse locations in Europe. These fungi show potential to increase the resilience of plants to aboveground pests by acting as endophytes.

There is a strong need to redesign cropping systems based on the integration of concepts from both ecology and agronomy and their application to agricultural systems. Practices that can be included are mixed cropping of species and varieties, ASCs cultivation, crop rotation, green manuring, compost utilization, introduction of flower strips, and reduced tillage practices, all of which can be differently combined according to the objectives to be reached. Even though the application of these agricultural practices, alone or in combination, have proven their efficacy under open field conditions, they are not commonly implemented in protected cultivation.

Five experimental sites (two in Mediterranean countries and three in Central and Northern countries) will demonstrate and study new organic cropping systems with increased resilience, which will be compared to standard cropping systems. Research activities focus on crop yield, nutrient availability, soil fertility, soil health and functional biodiversity. The University of Amsterdam and Wageningen University & Research will, within this project, focus on the effects of cropping systems on pest suppression. One of the aspects to study is how the

microbial communities in the soil from the five experimental sites affect aboveground pests through plant-mediated effects. The same soils will also be analysed by the Swedish University of Agricultural Sciences. This project partner will focus on the interaction between soil microbial communities and suppression of soilborne diseases.

Wageningen University & Research succeeded to isolate several strains of entomopathogenic fungi from the five organic greenhouse locations in Europe. These fungi show potential to increase the resilience of plants to aboveground pests by acting as endophytes that induce plant resistance and/or produce toxic metabolites. The isolated entomopathogens will be further evaluated as endophytes in tomato plants to assess their effects on tobacco whiteflies, *Bemisia tabaci* and the South American tomato pinworm, *Tuta absoluta*. The aim is to better understand the role of these fungi in aboveground pest suppression and to find ways to enhance the presence and impact of these beneficial fungi.

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