Universität Basel

Research Project

Plant Responsiveness to Microbiota Feedbacks

Third-party funded project

Project title Plant Responsiveness to Microbiota Feedbacks
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Project start 01.01.2020
Probable end 31.12.2023
Status Completed

The root microbiome of plants - analogous to the gut microbiome of animals or humans - extends the genetic and functional repertoire of its host. This microbiota directly improves plant health by securing the quality of the root and rhizosphere niche space by preventing pathogens to establish. Moreover, the root microbiota has important indirect functions for plant health as it becomes apparent in plant-soil feedbacks or in disease suppressive soils. For instance, the selective recruitment of beneficial microbiota members by plants result in a soil-borne immune memory at the benefit of the next plant generation. Specific compositions of the complex soil microbiota can prime a ‘state of alert’ in plants and induce systemic resistance and thereby improve plant health. Relatively little is known about the underlying mechanisms how plants respond to feedbacks of the soil microbiota. It emerges that not all plant genotypes are able to respond to beneficial microbiomes and that there is genetic variation in plant responsiveness to microbiota feedbacks. This is where this research project comes into play with the goal to establish the basic understanding of the underlying mechanisms and the genetic architecture of BX-dependent growth suppression. It is structured in three work packages with the first one investigating whether the root microbiota enhances their feedback when plants are under pathogen attack and ‘cry for help’. The second aim is to characterize the microbiota feedbacks in Arabidopsis and examining the involvement of defense hormone balance, priming and induced systemic resistance to uncover the underlying mechanisms. The third and main aim of this project is to dissect the genetics of plant responsiveness to microbiota feedbacks using high-resolution phenotyping and genome-wide association mapping. This project relies on state-of-the-art methodologies including pathogen and insect feedback assays, mutant analyses, transcriptome and microbiota profilings. Overall, this research is dedicated to understand how plants perceive and respond to differentially composed microbial communities. Identifying plant loci for positive responsiveness to microbiota feedbacks will open new opportunities to integrate beneficial plant-microbiome interactions into crop breeding programs, which ultimately will enhance sustainability of agriculture.

Financed by
Swiss National Science Foundation (SNSF)

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