Universität Basel

Research Project

Signaling pathways involved in the plant's response to plant growth-promoting rhizobacteria strains R62 & R81

Third-party funded project

Project title Signaling pathways involved in the plant's response to plant growth-promoting rhizobacteria strains R62 & R81
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There are myriads of bacterial species living in the plant's rhizosphere where root exudates and lysates provide nutrients (Lundberg et al 2012). Among them there are certain strains of fluorescent pseudomonads which are of particular interest because they stimulate growth and reduce the disease on plants. They are therefore called plant growth promoting rhizobacteria

(PGPRs) (Kloepper et al 1980, Lugtenberg and Kamilova, 2009). When a plant and a microbe come into contact, close communications (signaling) occur between the two organisms (Boller 2005). Plant-microbe communications rely on the interaction among a wide and heterogeneous world of molecules, so-called microbe-associated molecular patterns

(MAMPs), with corresponding pattern recognition receptors (PRRs), such as the flagellin receptor FLS2 or the EF-Tu receptor EFR (Boller and Felix 2009). In addition to these two well -studied examples, other proteins, enzymes or small peptides, oligo- and olysaccharides, fatty acids and even volatiles may influence the plant-microbe interactions (Boller and Felix 2009, Felix et al 1999). Beside a direct antagonistic effect, fluorescent Pseudomonas species can have an indirect effect on different types of pathogens as well, by stimulating the plant's innate immune system. This type of induced resistance is often referred to as rhizobacteria-mediated induced system resistance (ISR) (Van Loon 2007, Boller and He 2009). The research work I propose here will attempt to find a novel anti fungal compound (in crude extract) and understand which plant signaling pathways are responsible for the observed induced systemic resistance by the PGPR strains R62 and R81 in wheat and tomato crops. How does a plant recognize a microorganism as helpful or harmful, which are the main players? The present understanding on rhizobacterial fluorescent pseudomonad strains plant interactions is mainly focused on exploring ISR while the next challenge will be to determine the relevant MAMP-PRR interactions in the plant cells. Not only has the nature of the interaction between plant and micro-organisms to be understood in detail but also the role of metabolites/hormones in the ISR signaling pathways itself. For this purpose we will investigate the roles of metabolites/hormones in ISR signaling pathways and we will determine the level of these signaling molecules. To examine this, we will use different preparations from strains R62 & R81 and check whether they are active as MAMPs, using stress related responses in host plants. This project will add knowledge about the novel biotechnological approaches to crop protection with emphasis to investigate the molecular mechanism of induced system resistance by bacteria strains R62 & R81.

Keywords Biofertilization, Plant Growth Promoting Rhizobacteria; Arbuscular mycorrhizal fungi; Hydraulic lift

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