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Phytoalexins and bifunctional fusion proteins for plant protection

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Phakopsora pachyrhizi is a biotrophic fungus that provokes Asian soybean rust (SBR). Since, soybean varieties with resistance to all isolates of *P. pachyrhizi* are lacking, fungicide application is the most effective means for controlling SBR at the moment. However, emergence of fungicide insensitive pathogen strains and wash-off of active compounds by rain reduce the efficacy of fungicides. Hence, there is an urgent need to identify novel fungicides, increase persistence time of contact fungicides on plants and generate SBR resistant soybean genotypes. We identified POSTINVASION-INDUCED NONHOST RESISTANCE GENE 11 (PING11) which expression correlates with the accumulation of a phytolalexin during Arabidopsis postinvasion NHR. The phytoalexin inhibited germination of *P. pachyrhizi* spores and countered rust symptom development. Consistent with its key role in phytoalexin biosynthesis, overexpression of PING11 in transgenic tobacco BY2 cells enabled production of high amounts of the natural fungicide. Furthermore, stable PING11 expression in Arabidopsis and soybean led to constitutive accumulation of the antifungal metabolite. Current work addresses transgenic plants' disease resistance and the phytoalexin`s mode of action. We will also introduce the use of bifunctional fusion proteins (BiFuProts) as a tool for controlling SBR and other plant diseases by functionalizing the plant surface. BiFuProts consist of a plant leaf anchoring peptide fused to an antimicrobial peptide and are immobilized on leaf surfaces of different crops. Due to their exceptionally high rainfastness, antifungal BiFuProts may provide long-lasting crop protection and thus contribute to minimize fungicide use.

Biography

Caspar Langenbach has completed his PhD under Prof. Dr Katharina Göllner at the Plant Physiology Department of RWTH Aachen University in 2013. He then started his Post-doctoral career with focus on translational research in the Plant Biochemistry & Molecular Biology group of Prof. Dr Uwe Conrath at RWTH Aachen University. Since 2016, he is the Leader of the 'Agbiotech' subgroup in the Conrath lab. He has published several papers in reputed journals on molecular aspects of nonhost resistance and transfer of nonhost resistance-associated genes to provide enhanced resistance to Asian soybean rust.

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