

## Stable isotope-assisted metabolomics of *Fusarium* head blight on wheat

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Metabolomics studies show great potential to provide an improved understanding of the molecular mechanisms underlying plant diseases such as *Fusarium* head blight (FHB) on wheat. Here, we present the successful combination of LC-HRMS based global  $^{13}\text{C}$  labeling- &  $^{13}\text{C}$  tracer techniques to probe both the attack of the mycotoxigenic fungus *Fusarium graminearum* as well as the metabolic response of near isogenic wheat lines, differing in a major resistance QTL against FHB. To do so, parent and corresponding wheat NILs were cultured in the greenhouse and treated with *F. graminearum* spores at anthesis. In addition, custom-tailored, globally  $^{13}\text{C}$ -labelled wheat plants of the resistant and susceptible parent lines were grown as a reference in a tailor-made labeling chamber. To further elucidate the phenylalanine (Phe)- and tryptophan (Trp)-derived submetabolome, wheat ears were also treated with U- $^{13}\text{C}$  phenylalanine or U- $^{13}\text{C}$  tryptophan (Trp) under control- and infection conditions. LC-HRMS and subsequent data analysis clearly revealed

some 1.000 metabolites in the tested biological samples. Among those ca. 100 and 70 were found to be derived from the metabolic precursors Phe and Trp, respectively. Substance with levels, which were significantly affected by *Fusarium* have been further investigated for their putative role in QTL mediated resistance against FHB. The abundance of various substance classes differed significantly between the tested wheat lines with respect to both the timing of formation and relative amount. Our results for hydroxycinnamic acid amides, phenolic acids, flavonoids and lignans suggest that different molecular mechanisms contribute to defense and resistance against FHB. In this talk, I will present the isotope-assisted metabolomics protocols which we have developed and how we have investigated defense responses and resistance mechanisms of wheat against *Fusarium* head blight.

## Biography

Rainer Schuhmacher is an Associate Professor at University of Natural Resources and Life Sciences (BOKU), Vienna where he is heading the working group Metabolomics and Bioactive Compounds. His research focuses on LC-HRMS and GC-MS based metabolomics of microbes and plants with a special focus on the interaction between these living organisms. He received his degrees in Chemistry at University of Konstanz, Germany and Vienna University of Technology, and in 2009 he completed his Habilitation in Analytical Chemistry at BOKU University, Vienna. He is co-author of more than 120 SCI publications.

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