GSTspecial: Glutathione transferases in plant specialized metabolism

Project description
The goal of GSTspecial is to advance our knowledge of a particularly challenging group of plant enzymes, glutathione transferases (GSTs), to help close a major gap in our understanding of plant metabolism and pave the way for optimizations of plant utilization strategies. Plants are advanced chemists, producing a wealth of species specific molecules classified as specialized metabolites. They are important for plants in e.g. signaling, defense and climate adaptation, and used by humans as medicines and food ingredients, while our crop plants have been bred to reduce levels of toxic specialized metabolites. Understanding their biochemistry and physiology is therefore of general interest. The GST enzyme family is highly represented in plants, but poorly understood. It is characterized by low sequence similarities and differential localization patterns and in vitro activities. Physiological roles have been assigned to only few GSTs, but it is thought that several function in specialized metabolism. GSTspecial aims to elucidate such functions by a combination of state-of-the-art molecular techniques. The approach will alleviate the intrinsic problem in GST research of identifying substrates and products. The key technique is mass spectrometry imaging (MSI) which is new to plant science and rapidly advancing. With MSI, metabolite distributions in a sample such as a leaf cross-section can be visualized, and recent developments have pushed the spatial resolution of images to the single cell level. Liquid chromatography MS and MSI methods will be optimized for identification and distribution analyses of putative GST substrates and products, and the results will guide single cell-type transcriptome analyses to identify the associated GSTs. These will be characterized in vitro and in planta to identify their detailed physiological functions.

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