Bernd Schneider, Metabolomics 2014, 4:2
http://dx.doi.org/10.4172/2153-0769.S1.024

OMICS Group Conferences
Accelerating Scientific Discovery

3rd International Conference and Exhibition on
Metabolomics & Systems Biology
March 24-26, 2014 Hilton San Antonio Airport, San Antonio, USA

NMR- and MS-based micrometabolic profiling of special plant cell types and tissue

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Metabolomics and metabolic profiling of special plant tissue, cell types, and single plant cells is of considerable interest in natural product chemistry, chemical ecology and other disciplines of plant sciences. The identification of specialized natural products from microscopic plant samples, the composition of a mixture of metabolites and their temporal concentration changes are challenging for chemical analytics because of tiny amounts of material available. Mass spectrometry (MS) conventionally is the method of choice for studying such mass-limited samples. However, despite they are of moderate sensitivity, nuclear magnetic resonance (NMR) methods are useful to precisely determine the spatio-temporal distribution of metabolites in plants and other organisms. This is feasible especially when NMR is applied in combination with microscopic sampling methods such as laser-assisted microdissection. The excellent sensitivity of cryogenically cooled probes enables NMR-based metabolic profiling of secondary metabolites specifically accumulating in special plant cells. ^{1}H NMR, 2D homo- and hetero correlation experiments have been carried out on extracts obtained from a limited number of cells and major metabolites were identified in the mixture. Using ^{1}H NMR, the relative proportions of natural products in the samples were determined by integration and metabolites quantified by means of added standards. The combined application of laser microdissection, NMR, and MS to analyze metabolites in specialized plant cells will be discussed and examples will be presented.

Biography

Bernd Schneider is Head of the Biosynthesis/NMR research group of the Max Planck Institute for Chemical Ecology, Jena, Germany, since 1997. Between 1982 and 1996, he was a researcher at the Institute of Plant Biochemistry Halle, Germany. In 1991, He was awarded with an Alexander von Humboldt fellowship to work at Munich University. He has published approximately 230 papers and review articles. He holds a doctoral degree in chemistry from the University of Halle and did his habilitation at the Universities of Halle and Jena.

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