Quantitative Visualization of Sucrose in Plants

Using Fourier Transform Infrared Microspectroscopy

Sucrose is the primary transport form of sugars in plants. It therefore plays an essential role as an energy source, but also as a signal generator under stress. Scientists at the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) Gatersleben have developed a novel method for the visualization of sucrose at a previously unattained microscopic level. Thanks to this new technology, the sugar concentration in various plant tissues can be precisely determined. This provides researchers with a new precision tool to study sugar transport and yield potential in crops.

Sucrose is the main energy source, the main form of storage for sugar and a signaling substance. Due to its elementary tasks, sucrose affects almost all processes within the plant. Methods for the quantification of sucrose are available, but they do not provide any information on the local distribution in the respective tissues and organs. And precisely these distribution patterns are crucial for the physiological functions of the plant, as they allow statements on sugar transport, storage activity and yield formation.

Previous imaging methods for the mapping of sucrose are either not quantitative, too unspecific or even require a genetic modification of the plant to be examined, which would be problematic for use in crops. Researcher of the group of Dr. med. Ljudmilla Borisjuk of IPK Gatersleben developed a method based on Fourier Transform Infrared Microspectroscopy (FTIR). The new method for this question is relatively easy to perform and at the same time versatile. The FTIR-based method can quantitatively represent the sucrose distribution in various tissue types at a resolution of ~ 12 μm over a wide concentration range.

The research team has successfully applied the new technology not only to the model plant Arabidopsis thaliana but also to the cultivated plant barley (Hordeum vulgare).

Original publication:
André Guendel, Hardy Rolletschek, Steffen Wagner, Aleksandra Muszynska, Ljudmilla Borisjuk: Micro Imaging Displays the Sucrose Landscape within and along Its Allocation Pathways
Further information:

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