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Deciphering the link between sugar transport and vascular system development: A SWEET story

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In plant cells, carbohydrates are the main building blocks for central metabolism, for soluble sugars storage and polysaccharides synthesis. Sugars also serve as signaling molecules and osmotica during abiotic stress responses. Intercellular and intracellular transport systems are therefore, not only critical for long-distance sugar allocation but also to modulate local sugar partitioning ranging from tissular to subcellular scales.

The vascular system including phloem, (pro)cambium and xylem, is an important tissue for sugar transport. A complex network of transcription factors controls its formation. At the cellular level, cytosolic sugar availability is regulated by sugar exchanges at the plasma membrane and the tonoplast, through the transport of sugars by plasmodesmata as well as active and/or facilitated transporters, suggesting a complexity in fine tuning of sugar transport and homeostasis in the vascular tissues. However, the balance between nutrient/sugars availability in the vascular cells and their use for the development of the vascular tissues remains to be addressed.

We are interested in the link between sugar transport and the plant vascular system development. Among the various families of sugar transporters, we are focusing our analysis on SWEET transporters, the latest sugar transporter family identified, that facilitate the movement of soluble sugars along the concentration gradient. By using an integrated approach, at the cell and the whole plant levels, we functionally characterized in *Arabidopsis thaliana* several members of the SWEET transporter family and show that they are important for the vascular system development and the secondary cell wall formation. Additionally, our work shed new light on the central role of vascular parenchyma cells in these processes and further highlights the importance of finely regulated intercellular and/or intracellular sugar transport to assure appropriate plant growth and development.