Importance of sugar homeostasis within xylem parenchyma cells to sustain xylem development

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peptide signaling, which is crucial to permit non-cell autonomous action of a phloem-derived signal. The data suggest that via this signal, phloem acts as an organizer tissue in plant organ formation.

Key Words: Phloem, BRI1, CLE45, brassinosteroids

Importance of sugar homeostasis within xylem parenchyma cells to sustain xylem development

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The Arabidopsis floral stem xylem tissue is formed by xylary parenchyma cells and dead cells including xylary fibres and xylary vessels. Especially, these last two cells functions request the presence of an extra-thickened secondary cell wall whose synthesis requires an important amount of carbohydrate skeletons. However, the pathways by which carbon pools, transported as sugars, are supplied to the xylem cells remain unclear. Recently, the SWEET11 and SWEET12 genes coding for sugar transporters located at the plasma membrane of the vascular parenchyma cells were proposed to act in this mechanism (1). To gain more insights in this process, we analyzed the function of two additional SWEET genes coding for tonoplastic sugar transporters also expressed in the xylem parenchyma cells (2,3). We analysed combinations of sweet mutants using microscopy combined with high-throughput image analysis and vibrational spectroscopy techniques. Our analysis reveals defects in the number and the size of the xylary fibres in the sweet16sweet17 mutant, in contrast to the sweet11sweet12 mutant; that has been previously shown to be mostly affected in the xylary vessels (1). Interestingly, the quadruple mutant shows defects in both xylary fibres and vessels, suggesting an additive phenotype. Due to differences in the expression pattern of these genes in different categories of bundles connected or not to axillary buds, we also scrutinized the effects of these mutations depending on the vascular bundle type. Our results suggest that the sugar homeostasis within the xylary parenchyma cells is required to ensure a correct xylem development.

(1) Le Hir et al., 2015. Molecular Plant, 8, 1687-1690 (2) Chardon et al., 2013. Current Biology. 23, 8, 697-702 (3) Klemens et al., 2013. Plant Physiology. 163, 1338-1352

Long- and Short Distance Plant Electrical Communication

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Electrical signals represent a process that evolved very early in the history of life. Travel over long distances such signals provide for an efficient way of achieving cell-to-cell communication in living organisms. In plants, the phloem can be considered as a ‘green cable’ that allows the transmission of action potentials (APs) induced by stimuli such as touch, wounding and cold.

Charles Darwin over 100 years ago recognized that the Venus flytrap *Dionaea muscipula* is capturing animals. When an insect visits the *Dionaea* trap and tilts the mechanosensors on the inner surface, action potentials (APs) are fired. After a moving object elicits two APs, the trap snaps shut, encaging the victim and initiating the hunting cycle. Our studies show that within the different steps of the hunting cycle,