Master2 project (M2 2019/2020)

Plant Root Mechanosensing : a microfluidics study

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Access Map https://www.i2bc.paris-saclay.fr/spip.php?article1277

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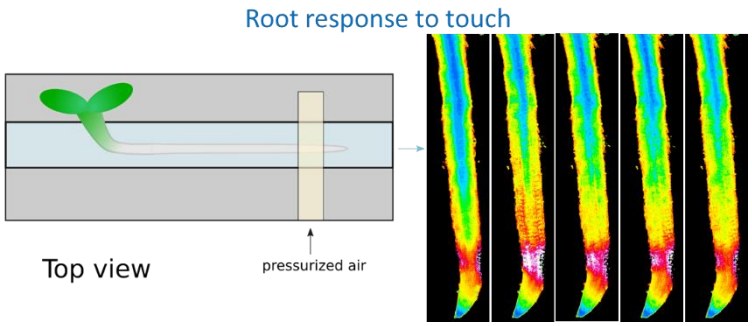
Background

Plant roots are submitted to a variety of mechanical constraints due to the presence of obstacles in the soil and to osmotic pressure variations of tissues. In this context, the study of the effects of mechanical constraints on roots at the organ, tissue and cell levels has become a major field of investigation. Within the framework of the DYNANO project (Saclay Plant Sciences Labex; https://www.i2bc.paris-saclay.fr/spip.php?article1401, we have developed custom microfluidic hydroponic chips for in-chip growth and microscopic study of *Arabidopsis thaliana* roots. We use microfluidic chips containing a pressure-driven PDMS microvalve in order to deliver a local mechanical stimulation to the root. Using genetically modified plant lines expressing fluorescent Ca^{2+} nanosensors, we have revealed the Ca^{2+} bursts elicited by touch stimulation and osmotic shock in live roots.



Project

This project aims at characterizing: (1) the mechanical stress applied to the root by a local pressure and by an osmotic shock, (2) the dynamic of the calcium signal triggered by these two types of stimulations.

These experiments will be in a first step performed on wild type Arabidopsis plants. Then they will be pursued on mutants affected in mechanosensor belonging to mechanosensitive channels.

Methodology: microfluidics (micro-ship fabrication), fluorescence microscopy, imaging, plant culture