INTERNSHIP PROPOSAL M2 RESEARCH 2020-2021

Plant Root Mechanosensing : a microfluidics study

Supervisor: Sébastien Thomine and Jean-Marie Frachisse

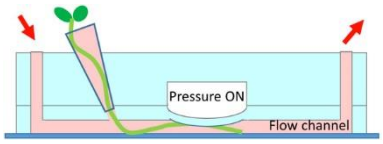
Address, phone, e-mail: Institute for Integrative Biology of the Cell (I2BC), Gif sur Yvette (Sud-West of Paris) Access Map https://www.i2bc.paris-saclay.fr/spip.php?article1277

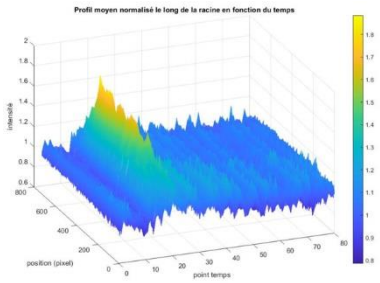
Phone: 33 (0)1 69 82 46 32

mail: sebastien.thomine2bc.paris-saclay.fr and jean-marie.frachisse2bc.paris-saclay.fr

INTRODUCTION, SCIENTIFIC CONTEXT :

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 are developing custom microfluidic hydroponic chips for in-chip growth and microscopic study of *Arabidopsis thaliana* roots. The objective is to design microfluidic chips containing a pressure-driven PDMS microvalve in order to deliver a local mechanical stimulation to the root. Plant lines expressing fluorescent Ca^{2+} nanosensors will be used to reveal the spatial and temporal dynamics of Ca^{2+} bursts elicited by touch stimulation in live roots.





RESEARCH PROPOSAL :

This project aims at (1) designing microfluidic chips allowing to apply controlled local constraints on roots, (2) characterizing the mechanical stress applied to the root by a local pressure (root deformation versus pressure applied) and (3) studying the dynamic of the calcium signal triggered by the local pressure stimulation

METHODOLOGIES :

microfluidics (micro-chip fabrication), fluorescence microscopy, imaging, plant culture

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