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Dynamics of the calcium signal elicited by mechanical stimulation of the root in the model plant Arabidopsis

Vassanti Audemar, Yannick Guerringue, Joni Frederik, Isaty Melogno, Pauline Vinet, Avin Babataheri, Sébastien Thomine, Jean-Marie Frachisse

Abstract \*

Plant roots experience a variety of mechanical stresses during their progression in the soil. The pressure exerted by the soil and physical obstacles that roots have to overcome generate forces that are sensed by the tissues and transduced into cytosolic calcium concentration increases. The duration, amplitude, frequency and spatial distribution of the calcium elevation determine the calcium signature allowing specific responses to diverse cues. In order to address the question of the relationship between root deformation and calcium signaling we have developed a system combining fluorescent microscopy on plant expressing R-GECO1-mTurquoise Ca<sup>2+</sup> nanosensor with a microfluidic device allowing to apply a controlled mechanical pressure on the root. Our experimental design proved to be suitable for investigating root deformation together with calcium variation induced by a mechanical stimulation. Our experiments revealed that (1) strain rather than stress of tissues is relevant to trigger the calcium signals, (2) calcium signal is elicited at the onset of a pulse of pressure and a second one is elicited when the pressure is released, (3) signals are localized to the tissue under pressure and do not propagate, (4) signals exhibit a strong attenuation upon repetitive stimulations.

The system we set up, thanks to its versatility, will open new perspectives, such as the identification of the molecular mechanisms underlying the calcium increase and the discovery of the adaptive outcome of local calcium signaling.

Type \*

Oral/Poster

Section \*

Axe1 New Chemical Strategies

Axe 2: Nanoprobes and Biosensors

Axe3: Label Free analysis and imaging

Axe4: from nano to in vivo