Year of CfP: 2009

Project No 0902-018

Project title: Coupling photon and proton imaging: towards a 3D functional imaging in plant (Green Imaging)

Unit managing the project: AGAP (Genetic improvement and Plant adaptation) (CIRAD, INRA, Montpellier SupAgro)

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Subthematic axes: IPB-1 (Integrative Plant Biology 1: *Genetics and genomics, plant breeding, ecophysiology*)

Objectives:

The success of reductionist approaches to study plant adaptation to abiotic stress conditions in plant research has yielded an unprecedented knowledge at the molecular level. However plant adaptation to environments with sub-optimal growing conditions is multi-level concept and researchers now face the challenge of integrating this knowledge into a complete understanding of whole systems. This is a crucial task for the understanding of the abiotic stress tolerance and for knowledge-based breeding plant for the future.

Advanced imaging techniques offer an important stepping stone to integrate these disparate approaches. Multiphoton microscopy and Magnetic resonance imaging (NMR) address different properties of the sample and operate on different geometrical scales. Magnetic resonance micro-imaging (NMR) addresses molecular properties (nuclear spin) related to the atomic composition and to specific chemical groups. It has a great potential for physiological studies of plant abiotic stress. On the other hand, Multiphoton imaging stimulates the auto-fluorescence of bio-molecules such as pigments or secondary metabolites. It also allows to image in 3D, fusion proteins with a fluorescent tag allowing localising proteins involved in water and cation (i.e. sodium) transport. By contrast with microNMR, multiphoton microscopy has a higher resolution allowing cell visualisation.

The objective of this project is the coupling of NMR micro-imaging to multiphoton imaging. All the necessary conditions are now in place to successfully meet this important challenge.

Success in combining these two complementary non invasive life imaging techniques will pave the way to coherently trace accumulation and transport process from the level of the whole plant organ and organism down to single cells. Coupling these two complementary imaging techniques will allow developing a synoptic view of plant adaptation to abiotic stress from gene to the whole plant body.

Total Agropolis Fondation funding: €100,464 (allocations for post-doctoral fellow and pre-doctoral students, travel expenses, running costs)

Funding category(ies): Agropolis Fondation post-doctoral fellowship, Agropolis Fondation small grants (support for small exploratory, risky and innovative projects, « proof of concept », new frontier research; support to pre-doctoral students; support to prepare applications for national or international calls for proposal (e.g. ANR and EU FPs))

Project duration: 01 January 2010 - 30 June 2013

Keywords: NMR – mutiphoton imaging – abiotic stress