

## SENS Imaging

### Coupling photon and proton imaging: towards 3D functional vision in plants

#### ABSTRACT

The project has allowed the development of three new imaging methods providing additional and complementary informations on the location and the mobility of the water inside the plant: -a method of MRI imaging allowing the visualization of the water in the plant and its mobility with a tissular and subcellular resolution

-a 3D tomo-histology method allowing to image anatomy with a focus on tissues involved in water transport (vessels) and stocking (ie parenchymas) but also proteins involved in water transport (aquaporins).

- an X-ray tomography imaging methods allowing to visualize and to map tissue density.

The project confirms the interest of the new techniques of imaging for plants: the RMN for water localization and the tomography RX for the evaluation of the density of plant tissues.

The algorithms developed by INRIA have enabled the alignment and the merging of the three 3D-image sources. The resulting composite image contains the information generated by the three image sources. Thus it is possible to view on the same image the transported (water) the water carrier proteins (aquaporins) and the structures involved in water transport (vessels) and water storage (parenchyma) inside the plant. The biological interest of the composite image could be shown among the sorghum (plant support the project), The composite image resulting from the fusion of the tree image sources represents a highly attractive substrate for modelling water transport and storage in plants

This project has demonstrated the feasibility of a multimodality imaging in plants and has enabled us to assess its potential contribution in the understanding of the functioning of plants

**Keywords :** Microscopic (Gene/cell), Operation, Modelling

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**Project type :** AAP

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**Flagship project :** no

**Project leader :** Jean-Luc Verdeil Genevieve Conejero

**Project leader's institution :** CIRAD INRA-INRAE

**Project leader's RU :** AGAP BPMP

**Budget allocated :** 73338.72 €

**Total budget allocated ( including co-financing ) :** 100464 €

**Funding :** RTRA

#### PERSPECTIVES

The methodology established in the framework of this project presents a high potential for the study of plants behaviour and physiology of plants under abiotic stress (water stress, sodium stress)

Writing of two publications