

Transnational Access Report

1. General Information

Project Acronym (ID):	ID2M2
Project Title	"Imaging the D ynamic D evelopment of the M orphology of the M aize Seed"
Installation used	X-ray Microtomography
Name of Group Leader	ROUSSEAU David
Name of organization	Université Lyon 1

3. Project summary (max. 250 words)

Background: Despite increasing demand, imaging the internal structure of plant organs or tissues without the use of transgenic lines expressing proteins remains a challenge. Techniques such as magnetic resonance imaging, optical projection tomography or X-ray absorption tomography have been used with various success, depending on the size and physical properties of the biological material.

4. Main achievements (max. 250 words)

Results: X-ray in-line phase tomography was applied for the imaging of internal structures of maize seeds at early stages of development, when the cells are metabolically fully active and water is the main cell content. This 3D imaging technique with histology-like spatial resolution is demonstrated to reveal the anatomy of seed compartments with unequalled contrast by comparison with X-ray absorption tomography. An associated image processing pipeline allowed to quantitatively segment in 3D the four compartments of the seed (embryo, endosperm, nucellus and pericarp) from 7 to 21 days after pollination

Conclusion: This work constitutes an innovative quantitative use of X-ray in-line phase tomography as a non-destructive fast method to perform virtual histology and extends the developmental stages accessible by this technique which had previously been applied in seed biology to more mature samples.

5. Publications related to the access granted, acknowledging the support by EC.

PLME-D-15-00056R1 accepted in Plant Methods under the title Fast virtual histology using X-ray in-line phase tomography: Application to the 3D anatomy of maize developing seeds David Rousseau; Thomas Widiez; Sylvain Di Tommaso; Hugo Rositi; Jérôme Adrien; Eric Maire; Max Langer; Cécile Olivier; Françoise Peyrin; Peter Rogowsky to be published online in 2015.