

BASIC INFORMATION ON SUB-PROJECT

NAME OF PROGRAMME/FUND	Scholarship Fund - Sciex NMS ^{ch}
RESEARCH FIELD AND OTHER RESEARCH FIELDS INVOLVED (if applicable)	Mathematics / Natural Sciences
TITLE OF THE SUB-PROJECT	Investigating the mechanical properties of plant cells using MEMS technology (IMPPC)
REGION OF THE CZECH REPUBLIC (according to the location of the home institution)	West Bohemian Region
GRANT AMOUNT SPENT	50 560,72 CHF
INTERMEDIATE BODY	Swissuniversities
HOME INSTITUTION	University of West Bohemia in Pilsen Department of Mechanics, Mechanics of Microstructure
HOST INSTITUTION	University of Bern Institute of Plant Sciences
NAME OF THE FELLOW	Petra Kochová

ABSTRACT OF THE SUB-PROJECT

Although considerable research effort is focused on understanding cells at the molecular and genetic levels, comparatively little is known about their mechanical properties. Using state of the art microelectro-mechanical systems (MEMS) force sensing devices developed at the University of Zurich, we plan to do experiments to measure mechanical properties of the plant cell wall. MEMS technology operates at a force range between what can be measured with atomic force microscopy and traditional tonometers. The subject of our study will be BY2 tobacco cells, a classic plant cell system chosen for their suitable properties for mechanical study. With this plant system it is possible to obtain single intact cells as well as short lines of cells that exhibit polar growth. The cells are also quite large (50 microns or more), and are relatively easy to handle. They are also straightforward to transform, with many inducible and fluorescent marker lines available. Measurements on BY2 cells will be carried out using MEMS equipment acquired by the host institute through a collaboration with Prof. Brad Nelson's group at the Institute of Robotics and Intelligent Systems in Zurich. Experiments will begin by measuring the deflection and the forces of the non-treated cell wall in solutions of various osmolarities (inducing varying pressure within the cells) with MEMS sensors and micro-tweezers. Next we will monitor the mechanical effects of applying various substances known to affect cell wall expansion, such as expansins, pectin methyl esterase, and upstream signaling molecules such as the plant growth hormone auxin.

MAIN RESULTS

Participation on installation of Cellular Force Microscopy machine and initial testing.

Routier-Kierzkowska AL, Weber A, Kochova P, Felekis D, Nelson BJ, Kuhlemeier C, Smith RS. Cellular force microscopy for in vivo measurements of plant tissue mechanics. *Plant Physiol.* 2012 Apr;158(4):1514-22. doi: 10.1104/pp.111.191460. Epub 2012 Feb 21.

DATE OF REALISATION OF THE FELLOWSHIP	1.9.2010 – 31.10.2010, 1.1.2011-30.4.2011
MORE INFORMATION ON THE PROGRAMME	www.sciex.ch