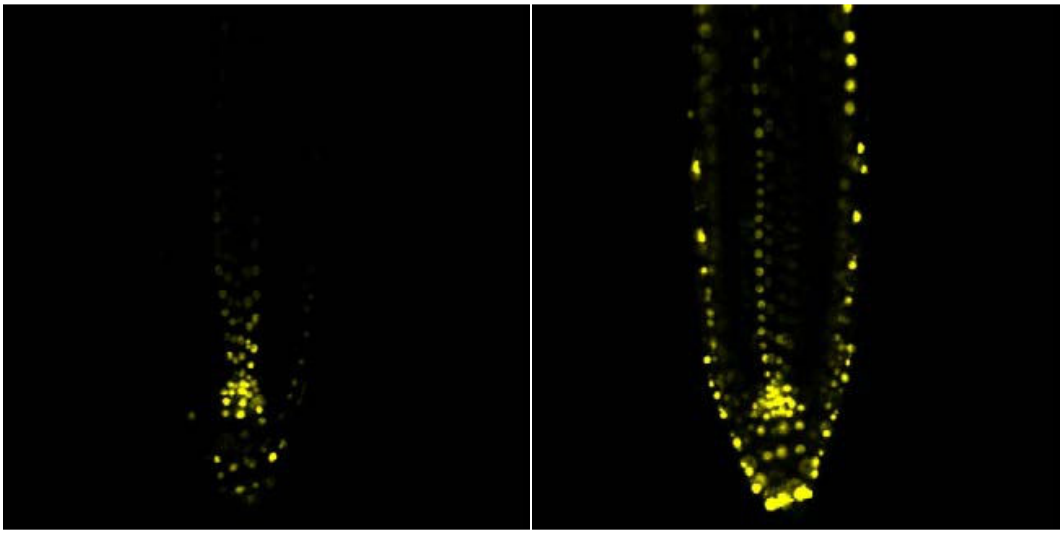
3D imaging and analysis of the effect of small molecules on the auxin-mediated signaling pathway in *Arabidopsis thaliana*

Project description

The phytohormone auxin is a key regulator of plant development. Quantitative and objective measures of how different small molecules affect auxin-regulated pathway are valuable tools to dissect and understand auxin-mediated processes in plants.

This Master thesis project aims at establishing an image analysis pipeline to automatically and quantitatively analyze the effect that small compounds induce on the auxin-mediated signaling pathway. To do this, an *Arabidopsis thaliana* line expressing an auxin-responsive promoter fused to a fluorescent protein will be employed. The promoter fusion is targeted to the nucleus and is activated when the phytohormone is present. To quantify and analyze the effect of added compounds on the auxin-mediated signaling pathways, the number, intensity, and position of fluorescing nuclei in the root, constitute phenotypes and should be quantified.Two examples of 2D confocal images of the auxin-promoter-Venus construct are shown below. A negative control (untreated) phenotype is displayed to the left and a chemically induced (treated) phenotype is displayed to the right. In the project, image processing and pattern analysis methods to enable automatic quantitative phenotyping will be developed. In addition, dose response tests will be performed to determine the minimum active concentration of the small molecules on hormone mediated signaling pathways.

The student will acquire 3D images of plant roots using a confocal microscope at Umeå Plant Science Centre. These will be used to develop the image analysis pipeline at the Centre for Image Analysis in Uppsala. Once the pipeline is established, the student will acquire images and analyze the effect and establish the dose responses for novel molecules. Hence, the student will spend a few weeks of the total project time in Umeå (travel and accommodation will of course be provided).



Examples of different expression patterns of the nuclear localized auxin-responsive promoterDR5-NLS::Venus

Conditions & Requirements

The master thesis project will be carried out mainly at the Centre for Image Analysis in Uppsala under the supervision of Dr. Ida-Maria Sintorn. A few weeks of imaging will however be performed at Umeå Plant Science Centre in Umeå under the supervision of Dr. Stéphanie Robert. Basic image analysis and programming knowledge is a requirement and knowledge/experience in cellbiology, microscopy and statistics is desirable.

For further information contact

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