Integrated model of plant organ growth

Integrative Modelling for understanding GenesxEnvironmentxProcesses interactions in the determinims of fruit and leaf growth

ABSTRACT

Understanding and predicting variations in the growth of sink and source organs as a function of the environment is a challenge for biologists. FruitLeafModel proposes to combine experimentation and modelling to understand the impact of water deficit (HD) on fruit and leaf growth in tomato, through an analysis of the main processes involved. The project is based on the Virtual Fruit Model (PSH Avignon) and the tools developed on the phenotyping (LEPSE Montpellier) and imaging (BFP Bordeaux) platforms.

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Project leader's RU : PSH

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GOAL

The project aims to measure cell division, cell expansion and DNA endoreduplication during leaf and fruit development in order to develop a model capable of predicting the interactions between these processes in response to water supply.

ACTION

The aim is (1) to develop a conceptual model of the interactions between cell division, cell expansion and endoreduplication in growing leaves and fruit; (2) to quantify and analyse the contribution of each of these processes to the response of the organ to water stress; (3) to integrate the knowledge into a mechanistic model that will make it possible to carry out in silico experiments and test the hypotheses put forward. The work focuses on WVA 106 and on transgenic mutants affected on the growth processes.

RESULTS

Within a leaf, cellular characteristics are common to all leaflets. At the plant scale variations in leaf or leaflet size are related to variations in the number of epidermal cells (Koch et al. 2018).
- DH reduces the size/mass of all organs. The reduction in leaf area is primarily related to a reduction in cell number, with small effects on cell size and endoreduplication levels. In fruit, the effect of DH is more marked on expansion than on cell division or endoreduplication.
- A first fruit model coupling growth processes has been developed (Baldazzi et al. submitted). Its

validation under different DH conditions (in progress) is a key step towards improving the manipulation of organ size and quality, evaluating existing genotypes and developing varieties adapted to the new agricultural context.