

Year of CfP: 2008

Project No 0803-027

Project title: 3D virtual fruit – application to the control of fruit growth and quality

Units managing the project: PSH (Horticultural Plants and culture Systems)(INRA), INRIA

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Country involved in the project: Poland

Sub-thematic axes: IPB-1 (Integrative Plant Biology 1: *Genetics and genomics, plant breeding, ecophysiology*)

Objectives:

Appearance (size, shape and color), taste (determined principally by sugar and acid contents), and texture are main components of the perception of fresh fruit quality. Fruit size and composition depend on cell division, cell expansion (driven by the cell turgor pressure and cell wall properties) and water and carbon accumulation and partitioning, some processes already described in ecophysiological models. Fruit texture, for which no model exists, depends on the rheological properties of tissues which rely on their structural units, including cells, cell walls and conducting vessels. Despite the identification and modelling of many individual processes, the control of quality on its whole is still poor because it is orchestrated by a variety of physiological interacting processes temporally and spatially organized during fruit development. This organization is not or only partially described in current fruit models and cross-talks among the different scales described in the fruit system are insufficient.

This project will gather the competence of plant modellers, physicists and ecophysicists to build-up a spatial and temporal model describing physical and biological laws involved in tissue differentiation and cell growth, in relation to fruit growth and compartmentation, and a number of related traits of quality (e.g. size, composition and texture). Nuclear Magnetic Resonance (NMR) and Magnetic Resonance Imaging (MRI) techniques will be employed so as to provide an *in vivo* validation of the model by non invasive measurement.

This 3D model will account for the fruit compartmentation into differentiated tissues and for the cellular organization of main tissues. Such a model will be a powerful tool to analyze and understand complex interactions at the cell, tissue and fruit levels, by coupling different levels of control and in particular by describing the mechanical constraints associated with the development of different tissues and with cell division and expansion in a given tissue. In the future, the integration of other processes or signals will provide an accurate description of the fruit functioning. This new multidisciplinary approach in fruit modelling is expected to provide with new hypotheses to better understand and manage fruit quality and with new methods to assess it *in vivo*.

Total Agropolis Fondation funding: € 218,141 (postdoctoral fellowship, travel expenses, equipment, running costs)

Funding categorie(s): Agropolis Fondation Post-doctoral fellowship

Project duration: 1 January 2009 – 30 April 2012

Keywords: virtual fruit – fruit quality – fruit growth – modelling