Coupling mechanical and hydraulic processes in multicellular models of plant development.
Ibrahim Cheddadi, Michel Génard, Nadia Bertin, Christophe Godin

To cite this version:

HAL Id: hal-01594819
https://hal.archives-ouvertes.fr/hal-01594819
Submitted on 3 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Distributed under a Creative Commons Attribution - ShareAlike 4.0 International License
Coupling mechanical and hydraulic processes in multicellular models of plant development

Ibrahim Cheddadi¹ and Christophe Godin¹

¹Virtual Plants INRIA-INRA team

Up to now, models of organ morphogenesis in plants have mainly focussed on the regulation of cell wall mechanical properties at cellular level, such as rigidity and mechanical anisotropy. However, growth is primarily powered by water fluxes and cell turgor.

In this work, we propose a new multicellular model to study the interaction between the hydraulic and mechanical processes involved in tissue development. In this model, turgor pressure appears as a flexible variable that can mediate between various growth constraints. We show that the coupling of both processes exhibits new emergent properties that can help interpret different aspects of morphogenesis in plant organs. In particular, in specific areas of the parameter space, the system can be interpreted as a new type of lateral inhibitory mechanism that could contribute to the amplification of organ shape differentiation.