S9-3
TOWARD A MECHANICAL MODEL OF 3D FRUIT DEVELOPMENT

Dr. Ibrahim Cheddadi, *INRA PSH, Domaine St Paul, Site agroparc, CS 40509, 84914 Avignon Cedex 9, France (presenting author)*
Dr. Christophe Godin, *INRIA project-team Virtual Plants, Campus St Priest - BAT 5, CC 05018, 860 rue de St Priest, 34095 Montpellier cedex 5, France (co-author)*
Dr. Frédéric Boudon, *INRIA project-team Virtual Plants, Campus St Priest - BAT 5, CC 05018, 860 rue de St Priest, 34095 Montpellier cedex 5, Choose a country (co-author)*
Dr. Valentina Baldazzi, *INRA PSH, Domaine St Paul, Site agroparc, CS 40509, 84914 Avignon Cedex 9, France (co-author)*
Dr. Michel Génard, *INRA PSH, Domaine St Paul, Site agroparc, CS 40509, 84914 Avignon Cedex 9, France (co-author)*
Dr. Nadia Bertin, *INRA PSH, Domaine St Paul, Site agroparc, CS 40509, 84914 Avignon Cedex 9, France (co-author)*

Understanding the controlling factors of fruit quality development is challenging, because fruit quality results from the interplay between physical and physiological processes that are under the control of genes and the environment. Although process-based models have been used to make significant progress in understanding these factors, they ignored to a large extent the shape and internal structure of the fruit, as well as mechanical interactions that are essential to properly model growth. To help characterizing effects of fruit shape and internal structure on quality, the creation of a 3D virtual fruit model that integrates fruit structure and function with growth governed by environmental inputs is investigated : we combine on the one hand a modeling pipeline that creates a 3D volumetric mesh of the internal fruit structure, including vasculature, and couples it with water and carbon transport; and on the other hand, a mechanical description where growth is related to the extension of the cell walls, which is triggered when the so-called turgor pressure inside the cells exceeds a given threshold. This approach is applied to study tomato fruit, in particular the influence of the mechanical properties of the cuticle on the global growth and the shape of the fruit.