

Title: New state-of-the-art imaging tools to study how crops adapt to environmental changes: *Solanum lycopersicum* key study.

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Plants are continuously subjected to environmental challenges and consequently adjust their development. Factors like abiotic and biotic stresses can significantly impact plant growth and yield. Therefore, it is crucial to understand how plants perceive and cope with external challenges and, in particular, to study early events. Most of the knowledge about the role of second messengers and other players comes from studies conducted on *Arabidopsis thaliana* expressing genetically encoded fluorescent indicators (GEFI). However, the use of the same technology for crops lags. *Solanum lycopersicum* is an important crop for the mediterranean area and for the EU economy. Thus, studying how this crop respond to environmental stresses is an important area of research. For these reasons, we decided to exploit the GEFI technology in *S. lycopersicum* by generating a battery of MicroTom CV lines expressing genetically encoded sensors for the *in vivo* analysis of Ca²⁺, pH, ROS and ABA dynamics. We here report the generation of MicroTom tomato lines expressing the Cameleon YC3.6 for Ca²⁺, the pH-GFP for pH, and the nlsABACUS2-400 for ABA. At present, we were able to confirm the existence of spontaneous Ca²⁺ oscillations in stomata guard cells and during pollen tube development.