

New state-of-the-art imaging tools to study how crops adapt to environmental changes: *Lycopersicum esculentum* key study.

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Being sessile organisms, plants are continuously subjected to environmental challenges and consequently adjust their development. Moreover, adverse conditions could reduce crop yield.

Therefore, understanding plant response to biotic and abiotic stresses is of vital importance.

In the last decades, molecular signalling from the stimuli perception to plant response was largely investigated. However, most of the available knowledges on plant signalling derive from studies performed on *Arabidopsis thaliana* model plant.

Thus, we decided to focus our attention on *Lycopersicum esculentum*. Tomato was chosen as model plant since it represents a worldwide economically important vegetable crop and its growth and productivity are sensible to inappropriate external conditions.

To better understand how crops deal with environmental stimuli, such as drought, salt, or osmotic stresses, we aimed at combining the development of tomato lines expressing genetically encoded biosensors with tailored *in-vivo* imaging approaches. Indeed, the generation of a battery of tomato biosensor lines will give us the possibility to study the role of important plant regulators, such as Ca^{2+} , pH, ROS and fitohormones, and to evaluate how crops cope with environmental stresses. The ongoing research allowed us to obtain the first tomato lines through transformation and regeneration of tomato explants. In this way, it will be possible to perform preliminary analysis to understand crop response to external stimuli.