Plant adaptation to calcareous soil upon climate change

OBJECTIFS

The main objective of the project is to characterize the molecular responses of plants to multiple abiotic stresses that are virtually impossible to predict from the knowledge on individual stress responses. The multiple stress scenarios chosen is a combination of a poor soil condition, exemplified here by calcareous soil, and a high temperature stress. The issue of low nutrient availability associated to high temperature is indeed of huge concern for agriculture in the context of climate change. In addition to a global agricultural issue, this also meets local interest, as our Mediterranean region holds a majority of calcareous soils and produces the major part of durum wheat of France. And actually, strong decrease (from -19 to -37%) of Durum wheat yield was reported in 2018, due to overall high temperature in spring.

To answer this question, we propose to implement a “translational biology” strategy that we specifically define as the opportunity to address fundamental biological questions directly using crops, together with model organisms. Contrary to “gene transfer strategies” where crops are only considered as destination organisms for the “insertion” of favorable alleles, originally identified on model plants, our proposal is to work ab initio on chosen crops, taking advantage on the resources and tools currently available that allow developing research projects on crops in parallel to model plants.

Three plant species have been chosen for this project, Arabidopsis thaliana and Medicago truncatula as model species, and durum wheat as a crop that is particularly relevant for the project since it is widely cultivated in the Mediterranean basin, where calcareous soils and high temperatures prevail.

ACTIONS

WP 1. Effects of calcareous soil condition and high temperature on plant growth, development, redox, mineral and metabolic status.

WP 2. Effects of calcareous soil and high temperature on genome expression

WP 3. GWAS on calcareous soil and high temperature.

WP 4. Combination of candidate gene, transcriptomic and GWAS to identify new gene regulatory networks

Responsable :

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INVESTISSEMENTS D'AVENIR

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