UNIVERSITÀ DEGLI STUDI DI PADOVA

DiBio
Dipartimento di Biologia

Mechanisms Of Stress Tolerance In Rice Plants: Components Of Signaling Pathways And Genes Involved In Response To Abiotic Stresses

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Sesto piano SUD (st. 9-10-15)

The drastic and rapid changes in global climate affect the crop productivity worldwide

Causing:
Sea Levels-rise

Flooding

Soil Salinity

Increasing CO_2 levels

High temperatures

Water scarcity

Scientists are searching new ways to improve crop tolerance to the negative consequences imposed by these new climate challenges

Rice (Oryza sativa, L.)

- ✓ It is the single most important source of calories for humans.
- ✓ It is grown mainly for direct human consumption with very little making it to other uses.
- ✓ Italy is the largest rice producer in Europe. Italian rice production is highly localized in Lombardy, Piedmont and Veneto regions.
- ✓ In Italy, the most diffused rice is *Oryza sativa* ssp. *Japonica*

Soil salinity is challenging the rice productivity in coastal areas

- ✓ 75% of the rice is produced in irrigated rice fields, most of which are located near the river deltas (such as Po, Mekong etc), which is currently threatened by the increase in soil salinization.
- ✓ Rice is the most salt sensitive species among cereals.

Selection of rice varieties with an improved salinity tolerance

Aims of this project

- Unveiling early signaling pathways induced by salt stress (Calcium and ROS dynamics)
- Identification of new traits specifically associated to salt tolerance useful for marker assisted selection of new rice varieties with improved salt tolerance

By adopting:

Physiological and Molecular approaches

Italian rice varieties:

Vialone Nano

Salt sensitive

Baldo

Salt tolerant

Formentin et al. 2018 Front Plant Sci

Approach

Analyses of Calcium signature and H_2O_2 waves along the plant after salt stress perception

Whole plant

Cultured cells

Tools: Plants and cells stably transformed with fluorescent probes, (YC3.6 Cameleon and HyPer)

Oryza sativa, L.
in hydroponics

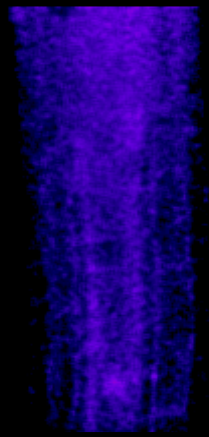
Project title:

Study of cell-specific pattern of calcium and H_2O_2 signatures through in vivo imaging.

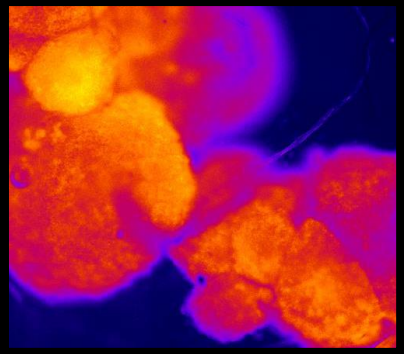
Techniques:

-in vivo imaging of Ca^{2+} and H_2O_2 (in plants)
-molecular biology
-physiological analyses in rice varieties with different salt tolerance/sensitivity

Ca^{2+} dynamics in rice root after salt stress



Ca^{2+} dynamics in rice cells after salt stress



H_2O_2 in rice roots after salt stress

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