Line 3 – Support to plant research

REGULATION OF PLANT FITNESS BY ION CHANNELS AND TRANSPORTERS OF THE BIOENERGETIC ORGANELLES CHLOROPLASTS AND MITOCHONDRIA

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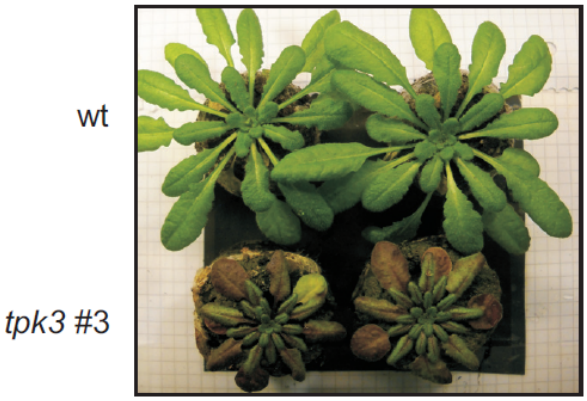
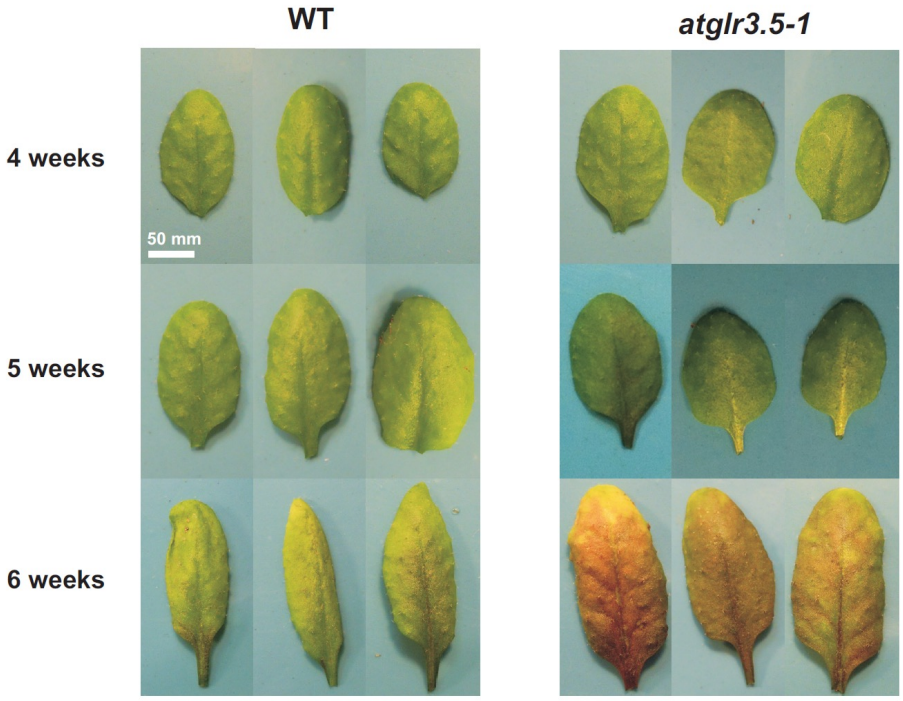
Project description

Production of ATP and reducing equivalents in mitochondria and chloroplasts importantly impact plant fitness. Growing evidence indicates that ion channels and transporters within the membranes of these organelles play a pivotal role in setting bioenergetic efficiency. Optimized energetic balance and protective mechanisms against high light and other stress stimuli, in turn are required for optimal plant growth and biomass production. By using the model plant *Arabidopsis thaliana* and combination of different biochemical biophysical and molecular biology techniques, we are currently aiming to define the set of molecules that allow the transport of ions across organellar membranes. In addition, using genetic means, we study the effect of the lack or overexpression of different ion-conducting pathways on the physiology of the whole plant. The studies carried out by far indicate an important role of ion channels and transporters for example for optimized photosynthesis, for the onset of photoprotective mechanisms but also for senescence and root growth. One of the aims of the project is to gain evolutionary insight into the regulatory mechanism exerted by ion channels, using different plants and lower organism, exploiting different species that are cultivated in the Botanical Garden. These studies are carried out through in-house joint projects (see above) as well as by collaborations with several laboratories from the world, including Prof. Alex Costa (Milan), Prof. Giovanni Finazzi (Grenoble), Prof. Cornelia Spetea (Gothenburg), Prof. Toshiharu Shikanai (Kyoto), Profs. Markus Schwarzlander and Ute Vothknecht (Bonn), Prof. Chris Chang (Berkeley). The research line receives(d) funding from the Italian Ministry (PRIN), the University of Padova and the Human Frontiers Science Program.



Plants lacking a thylakoid-located potassium channel (TPK3) display small size and brownish leaves due to impaired photosynthesis and photoprotective mechanisms (from Carraretto et al, 2013, Science).



Arabidopsis plants lacking a mitochondrial putative cation channel (GLR3.5) undergo anticipated senescence (from Teardo et al, 2015, Plant Physiology).