BRC Science Highlight
January 2019

Peroxisomal Fatty Acid β-Oxidation Negatively Impacts Plant Survival under Salt Stress

Background/objective

Peroxisomal β-oxidation is essential for oilseed germination and plays an important role in growth, development, and cellular homeostasis. The role of peroxisomal fatty acid β-oxidation in plant response to salt stress remains unknown. Yu et al. (2017)[2] found that TAG is an intermediate in fatty acid β-oxidation, and that blocking TAG hydrolysis reduced oxidative stress-associated damage.

Approach

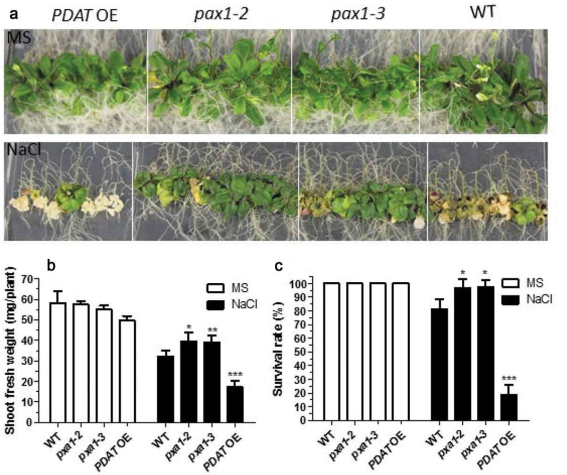
- Fatty acid β-oxidation's role in plant survival under salt stress was tested using 10-day-old plants grown on agar MS plates with or without 120 mM NaCl for 15 days.

Results

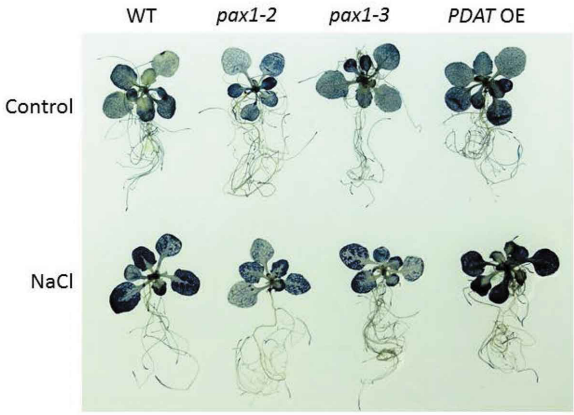
- A significant increase in survival rates in *pxa1-2* and *pxa1-3* was observed.
- Histochemical detection of ROS showed that disruption of *PXA1* reduced superoxide accumulation under salt stress, whereas *PDAT1* overexpression enhanced it.
- Overexpressing *PDAT1* caused a drastic decrease in survival under salt stress.

Significance

- These results support the idea that peroxisomal β-oxidation of fatty acids exacerbates oxidative stress, thus adversely impacting plant stress tolerance.
- CABBI seeks to increase TAG accumulation in bioenergy crops such as sorghum and *Saccharum*. Therefore, it is important to understand how blocking β-oxidation and TAG hydrolysis affects plant fitness and performance under stress.



Salt tolerance assay of WT, *PXA1* mutants and *PDAT*-overexpressing plants.



Superoxide detection in WT, *PXA1* mutants and *PDAT*-overexpressing plants.

[1]*Yu, L., Fan, F., Xu, C. (2019) "Peroxisomal fatty acid β-oxidation negatively impacts plant survival under salt stress", **Plant Signaling & Behavior**, DOI: 10.1080/15592324.2018.1561121*

[2]*Yu, L., Fan, F., Xu, C. (2017) "A Central Role for Triacylglycerol in Membrane Lipid Breakdown, Fatty Acid β-oxidation and Plant Survival under Extended Darkness", **Plant Physiology**, DOI: 10.1104/pp.17.00653*

CABBI
CENTER FOR ADVANCED BIOENERGY AND BIOPRODUCTS INNOVATION

U.S. DEPARTMENT OF ENERGY