Department of Molecular and Cellular Biology

Graduate Seminar MCB*6500

Friday, March 22, 2024 @ 12:00 p.m.

presented by:

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"Plastidial starch phosphorylase (Pho1) as a stress response enzyme in Arabidopsis thaliana"

Starch metabolism in plants allows for continued growth at night, and under stress conditions. Plastidial starch phosphorylase (Pho1) is responsible for both the biosynthesis and degradation of metabolic starch, favouring biosynthesis. Recent work demonstrates that oxidative stress conditions catalytically activate Pho1 by glutathionylation.
Oxidative conditions develop when plants are subject to stress and form reactive oxygen species, interfering with growth processes. When Pho1 is knocked out, the plant becomes more sensitive to abiotic stress conditions. I hypothesize that when subject to abiotic stressors, a titration of *Pho1* expression levels will positively correlate with starch accumulation in leaves and plant resilience to abiotic stress. Understanding how starch metabolism responds to abiotic stress will directly affect agricultural productivity in an unpredictable climate.
This study will employ several techniques to determine the biological significance of Pho1 in stress response. Lines of *Arabidopsis thaliana* with knocked out, under-expressed and over-expressed *Pho1* will be developed for analysis. Growth and developmental patterns, including biomass and growth rate, will be monitored. To observe metabolic patterns, transient starch and soluble sugar levels will be quantified over 24 hours. Further, quantitative real-time polymerase chain reaction (qRT-PCR) will determine *Pho1* expression under each stress condition. The resiliency of the mutant lines will be analyzed under transient water stresses. This research may uncover stress signalling pathways in higher plants, providing targets for future crop improvement. Since Pho1 is found almost entirely across the plant kingdom, the work performed applies to all major crops.