

CHARACTERIZATION OF GDSL LIPASES UNDER BASAL AND STRESS CONDITIONS

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Summer 2018 Research

Serine hydrolases are a large group of enzymes that perform many functions, including increasing the invasiveness of cancer and increasing the pathogenicity of bacteria infecting humans. The name “serine hydrolase” refers to an enzyme that catalyzes the breaking of a molecule into smaller molecules. The product of the Arabidopsis gene At2g38180 is a GDSL lipase; GDSL lipases are a group of serine hydrolases where the catalytic serine is within the sequence glycine-aspartic acid-serine-leucine.

To better understand the function of serine hydrolases, I examined a plant line that lacks the function of a gene encoding a serine hydrolase. Initial analysis showed that when the gene function was knocked out, lipids of the plant were altered. In particular, there is less digalactosyldiacylglycerol (DGDG(34:6)) and monogalactosyldiacylglycerol (MGDG(34:6)) in the transgenic plant leaves. To confirm that the lipid changes are due to the known gene knockout and not to other genetic factors, we crossed the mutant plant to wild-type plant. I let it self-cross to get the F2 generation, and I plan to use gel electrophoresis of polymerase chain reaction (PCR) products to identify if F2 plants have the knockout and wild-type genes. I also noticed that the plants with the gene knockout appear to differ from wild-type plants in branching on flowering stalk; the plants with the gene knockout have fewer branches compared to the wild-type (Fig. 1). Thus far I have measured this trait twice with one trial showing significant branch difference between the plants with the gene knockout and wild-type plants, and the second trial showing a trend similar to the first trial. Plans for future work include identifying if F2 generation plants have the knockout and wild-type genes, confirming the lipid compositional changes in the knockout plants and testing the effects of the gene alteration on response to environmental stress, e.g., overwatering.

Fig. 1: The At2g38180 KO is a plant in which a DNA insertion has interrupted or “knocked out” (“KO”) the function of At2g38180 gene. The KO plants have fewer branches on their flowering stalks than wild-type plants (WT). $n = 12$ ($P < 0.001$).

