Co-overexpression of AVP1 and PP2A-C5 Increases Plant Tolerance to Multiple Stresses

Zhang, Phyllis (School: Lubbock High School)

Many efforts have been made in genetically modifying plants to make them more tolerant to various stress conditions. For example, the overexpression of AVP1 and PP2A-C5 increases either salt or drought tolerance. However, in nature, plants are often exposed to multiple stresses. In this study, a hypothesis that the co-overexpression of AVP1 and PP2A-C5 would increase plant tolerance under drought and salt stresses when compared to wild-type, AVP1-overexpressing, and PP2A-C5 overexpressing plants was tested. Three week old plants were left unirrigated for the soil to dry to mimic drought conditions. Afterwards, two different salt concentrations were used: 1) 100 mM NaCl and 2) 200 mM NaCl. Five days after salt treatment, plants were re-watered. Two days after re-watering, some plants from the 200mM NaCl treatment were collected for real time quantitative PCR analysis, and twenty days after re-watering, survival rates were analyzed for both treatments while biomass was measured for plants of 100 mM NaCl treatment. There were no significant phenotypic or biomass differences under 100 mM NaCl and drought conditions, and the survival rates were all 100%. Under 200 mM NaCl and drought stresses, the survival rate of AVP1/PP2A-C5 co-overexpressing plants was 63%, AVP1-overexpressing plants was 38%, PP2A-C5 overexpressing plants was 19%, and wild-type plants was 0%. The real time quantitative PCR analysis indicated that transcript levels of some drought and salt stress related genes were much lower in AVP1/PP2A-C5 co-overexpressing plants than other genotype plants, indicating that stress levels were much lower in AVP1/PP2A-C5 co-overexpressing plants after the drought and salt treatments. Overall, this research supported my hypothesis.

Awards Won:

Patent and Trademark Office Society: Second Award of $500