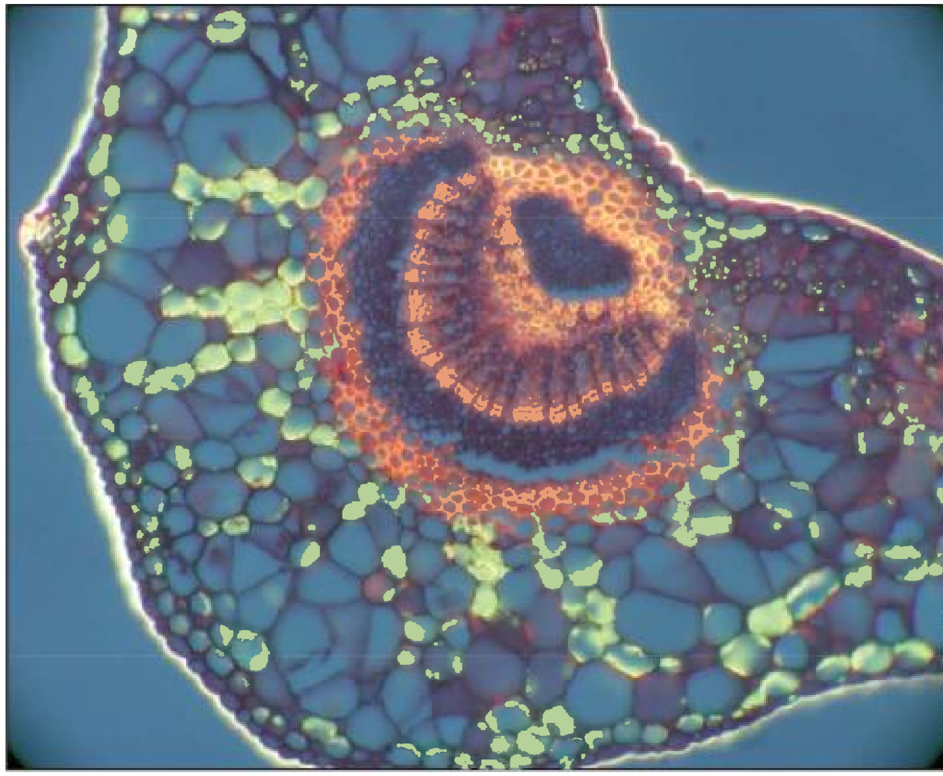
Azalea Research Foundation Project Progress Report

By Juliana Medeiros—Kirtland, Ohio

Project Title

Leaf hydraulic conductance of deciduous, evergreen and semi-evergreen Rhododendrons: diverse solutions to the problems presented by evaporative demand



▲ A cross-section of a deciduous Azalea (*Rhododendron atlanticum*) leaf, showing the leaf structure, including: the vascular tissue (orange center), and the leaf cuticle (bright yellow outline around the outside edge). The vascular tissue transports water to all the leaf cells, replacing water lost due to evaporation. The cuticle is a waxy coating on the leaf, which effectively seals the leaf surface to reduce evaporative water loss.

In October 2016 a student intern, Sharon Danielson, was hired to conduct work on this project for fiscal year 2016, using funding provided by The Holden Arboretum Norweb Fellowship. Sharon has an MS in Biology from John Carroll University. During the last two weeks of January we travelled to the lab of our collaborator, Dr. Lawren Sack (University of California Los Angeles). Dr. Sack, who is a pioneer in the field of leaf hydraulic conductance, discussed with us our experimental design and allowed us to use his equipment to conduct preliminary experiments. Based on Dr. Sack's advice we revised our apparatus design and protocol. Dr. Sack recommended that we quantify variability among leaves within a branch, and that we add measurement of stomatal conductance and leaf vein morphology to complement our hydraulic measurements. During our visit Sharon became proficient in the techniques used to effectively estimate leaf hydraulic conductance (Kleaf). Subsequently, we used funds from ASA and other funding sources to purchase all of the equipment needed to build an apparatus used to monitor leaf hydraulic conductance in *Rhododendron* leaves.

To date we have analyzed leaf hydraulic conductance and stomatal conductance data for 7 plants. We found that maximum Kleaf is higher for plants that are less cold-hardy (Fig. 1). This finding is in keeping with our prediction that species from warmer climates should have a higher capacity to transport water within the leaf, because warmer climates have higher rates of evaporation. We have not seen clear differences between evergreen, deciduous and semi-evergreen leaves, though most of the samples we have analyzed so far are from evergreen species. In addition, within evergreen species we found a strong correlation (R-squared = 0.91) between maximum Kleaf and stomatal conductance. This provides a good deal of confidence in our Kleaf measurements, because plants with higher stomatal conductance should have a higher capacity to transport water within the leaf. We do not yet have enough data for deciduous or semi-evergreens to examine that relationship. We expect to complete data collection on Kleaf and stomatal conductance by the end of June 2016. The leaf vein morphology data will be collected by another Holden intern during the summer of 2016. We expect to move forward with the full-scale experiment examining Kleaf for the 19 of the species listed in our proposal beginning in the summer of 2016.

Bud cold hardiness data used with permission from the American Rhododendron Society.

Lead Researcher: Juliana Medeiros, Scientist, The Holden Arboretum, 9500 Sperry Rd., Kirtland, Ohio 44094, 440-602-3819, jmedeiros@holdenarb.org.