Azalea Research Project Background

By Dr. Juliana Medeiros— Kirtland, Ohio

[The Summer 2016 issue of The Azalean published a report by Dr. Medeiros that was given to the Azalea Research Foundation Committee. What follows is more properly an introduction to the research. We will print a summary of the final project report when the research is completed, Ed.]

Have you ever wondered why some azaleas grow better in warm, sunny locations, while others do better in cool climates with lots of shade? Scientists working at The Holden Arboretum in Kirtland, OH, funded in part by the Azalea Research Foundation, are currently conducting research aimed at solving this mystery. Dr. Juliana Medeiros and student intern Sharon Danielson, are examining differences among *Rhododendron* species in leaf hydraulic conductance, or the capacity of the leaf to replace water lost through evaporation. This trait is one of the most important physiological components of plant tolerance to heat and drought, and is determined primarily by the leaf structure along with the temperature and humidity of the air. The broad diversity of leaf morphology across genus *Rhododendron* suggests that leaf hydraulic conductance may play an important role in habitat diversity, but the functional significance of this has been understudied. Dr. Medeiros hypothesized that, compared to species from cool climates, those species native to warmer climates can transport more water through their leaves, preventing leaves from becoming dehydrated under higher rates of evaporation.

So far, this hypothesis has been supported, particularly in the evergreen *Rhododendrons*, but the study has also yielded some exciting discoveries about evergreen azaleas. Specifically, *R. kiusianum* has lower than expected leaf hydraulic conductance compared to other species from similar climates, while that of *R. yedoense* was higher than expected. Interestingly, these data show that plants from warmer climates do not always have a higher capacity to replace water to the leaves, suggesting that other leaf traits mediate the leaf-climate relationship in evergreen azaleas. For example, if *R. kiusianum* leaves have a very thick leaf cuticle they could be protected from high rates of evaporation, even under very hot climate conditions. This could reduce the amount of resources used for leaf vascular tissue, which is costly to construct. On the other hand, the delicate leaves of *R. yedoense* may have a very thin cuticle, which would make them more vulnerable to desiccation, requiring higher density of leaf vascular tissue and greater leaf hydraulic conductance to maintain hydration. Data collection on the project continued through the summer, and current work includes examination of other leaf traits, like cuticle thickness and patterns of venation. In the end, this work is expected to provide new insights into the physiological mechanisms behind climatic hardiness in genus *Rhododendron* as well as to reveal variation that may be capitalized on in breeding for increased heat and drought tolerance.

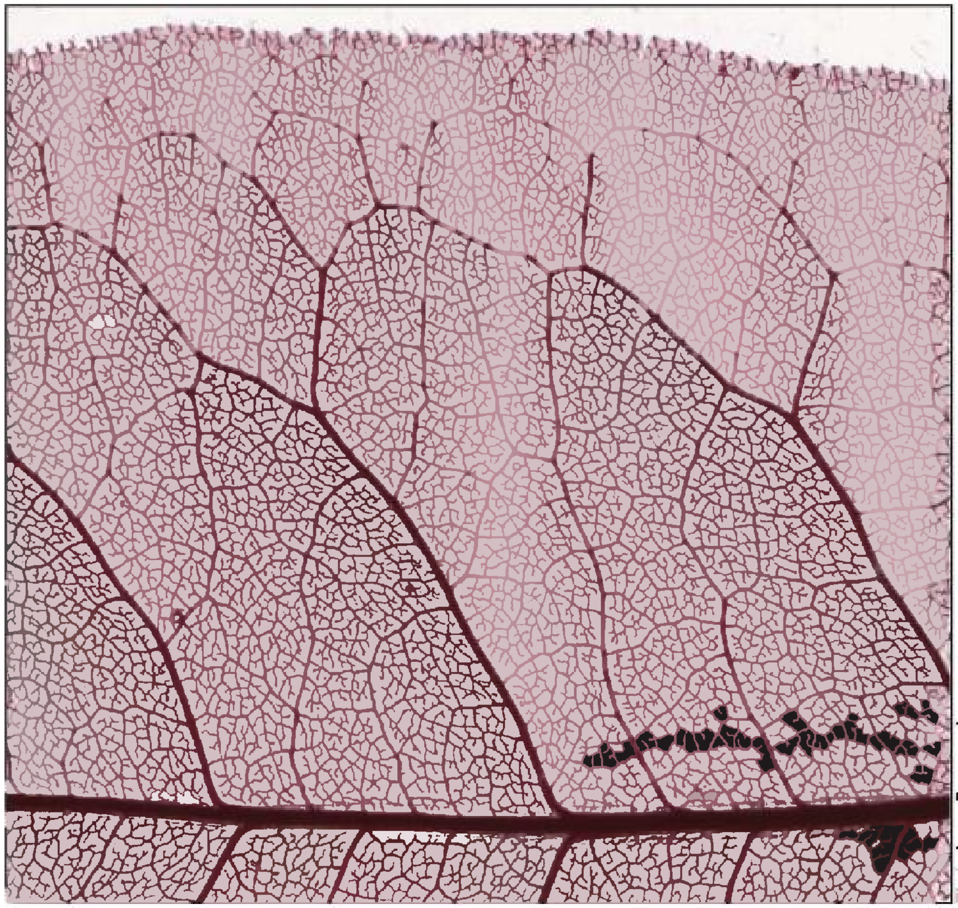

Photo Aaron Baumgardner

▲ The leaf venation network of a deciduous azalea (*Rhododendron austrinum*), showing the vascular tissue in dark reddish-brown. The vascular tissue transports water to all the leaf cells, replacing water lost due to evaporation.

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