2014

Relationship between Dehydration Tolerance of California Ferns and the Mechanical Strength of their Stipes

Helen I. Holmlund  
*Pepperdine University*

Jarmila Pitterman  
*Pepperdine University*

Stephen D. Davis  
*Pepperdine University*

Follow this and additional works at: [https://digitalcommons.pepperdine.edu/sturesearch](https://digitalcommons.pepperdine.edu/sturesearch)

Part of the *Biology Commons*

**Recommended Citation**


https://digitalcommons.pepperdine.edu/sturesearch/133

This Research Poster is brought to you for free and open access by the Undergraduate Student Research at Pepperdine Digital Commons. It has been accepted for inclusion in Featured Research by an authorized administrator of Pepperdine Digital Commons. For more information, please contact Katrina.Gallardo@pepperdine.edu, anna.speth@pepperdine.edu, linhgavin.do@pepperdine.edu.
In seed-bearing plants, the mechanical support of the vascular system lies in the fibers that surround vessel and tracheid conduits. This mechanical support provides the plant with protection against implosion under large negative pressures and cavitation (Jacobsen et al., 2005). Plant species with more mechanical support have been shown to be more cavitation-resistant due to the fiber-strength protection (Jacobsen et al., 2005). However, current anatomical theory states that in ferns, the mechanical support for the stem (stem) is unconnected from vessels and tracheids. Support is relegated to hypodermal sclerenchyma tissue, external to vasculature, just under the epidermis, around the vascular tissue, leaving the xylem vasculature without the mechanical support observed in seed-bearing plants.

Given our current understanding of fern anatomy, it would be of utmost importance to compare the mechanical strength of different species. If indeed the mechanical support for the stem lies solely around the perimeter of the vessel, then not within the vasculature, then we could compare the mechanical strength among fern species that are more and less resistant to water stress. Therefore, we hypothesized that there would be no significant difference in the mechanical strength of the stems of water-stress resistant and water-stress sensitive species of ferns.

It should be noted that Jacobsen et al. (2005) used cavitation to calculate a surrogate for resistance to water stress. In this study, we proposed to also test water stress by means of the osmotic water potential at the target loss point (Ψw,50) percent soil moisture, and minimum seasonal water potential (Ψw,min). Therefore, we directly measured resistance to cavitation in two species using the centrifuge method for assessing vulnerability to cavitation as described by Alder et al. (1997).

Furthermore, we considered the possibility that some fern might adapt to water stress by means of osmotic adjustment. This hypothesis was tested by taking the osmotic potential at the target loss point (Ψw,50) at different points in the season. We also compared ferns in the Santa Monica Mountains to ferns in the Santa Cruz Mountains.

Hypothesis: There will be no significant difference in the mechanical strength of fern stems between water-stress resistant species and water-stress sensitive species of ferns.