The Mechanical Strength of Malosma laurina Leaves Corresponds with Survivability During Extreme Drought

Alexander Booth  
*Pepperdine University*

Alexander Corwin  
*Pepperdine University*

Matthew Chung  
*Pepperdine University*

Follow this and additional works at: https://digitalcommons.pepperdine.edu/sturesearch

Part of the Biology Commons

**Recommended Citation**
https://digitalcommons.pepperdine.edu/sturesearch/122
**Abstract**

With the recent extreme drought that Southern California is facing, many plants’ survivability adaptations have proven insufficient. The Malosma laurina plant is known for its incredible ability to survive through droughts and wildfires with its adaptations of resprouts regeneration and it’s roots that can reach a depth of 40 feet to gather deep ground waters. We theorized that the mechanical strength of the leaves directly relates to its survivability during droughts. To explore this theory we took focused samples specifically on M. laurina resprouts. With two groups, one fully alive and one dying, we took six samples from six plants within each group, for a total of twelve total plants and seventy-two leaf samples. We predicted that the alive plants, that are able to endure the drought, will have a higher mechanical strength due to the water filled cells within the leaf. We expected our results to conclude that plants that are healthier and better hydrated shall have a greater mechanical strength than those of poorer health and lower hydration.

**Materials and Method**

We collected six leaves from two groups of resprout M. laurina plants. The two groups were Alive resprouts and Dying resprouts. We selected the leaves from the generally middle section of the resprout to ensure that there would be less error due to the amount of sunlight exposure. After harvesting the leaves we stored them in an ice chest and immediately took them to the Instron 5940 machine to measure their mechanical strength.

**Results**

![Figure 1. Average Load at Tensile Strength at Average Tensile Strength at break of the alive Malosma laurina. Significant change in average load from the third plant to the fifth.](image)

![Figure 2. Average Load at Tensile Strength at Average Tensile Strength at break of the alive Malosma laurina. Gradual change.](image)

**Discussion**

Our hypothesis led us to believe that due to the xylem fiber dilation within a M. laurina leaf, because of the amount of water, the mechanical strength of the leaf would be significantly different between the leaves (plants) that were well/decently hydrated verses those that were not. However, our results depict a similar trend and values for the alive and dying plants. It seems that even though the dying plants were unable to survive efficiently during the drought, their average xylem fiber force capacity (tensile strength) was relatively equivalent to the xylem tensile strength of the alive leaves. We believe this is because of the M. laurina’s drought adaptations, meaning that the plant continues to use it’s resources to keep the leaf as healthy as possible, even while dying, so that the plant is able to gather as much sunlight as it can for energy. We conclude that the mechanical strength of the leaf slowly starts to decrease as it begins to die, however, there is no significant change in the tensile strength. Thus falsifying our theory.

**References**

1. Taylor, Eric S.; Anderson, Brad J.; and Stites, Brandon E., "Exploring the Hydration Levels of Malosma laurina at Different Elevations on a Man-made Trail" (2012). Pepperdine University, All Undergraduate Student Research. Paper 39
3. Ronald A. Balsamo, Aaron M. Bauer, Stephen D. Davis, and Benita M. Rice. Leaf biomechanics, morphology, and anatomy of the deciduous mesophyte Prunus serrulata (Rosaceae) and the evergreen sclerophyllous shrub Heteromeles arbutifolia (Rosaceae)

**Acknowledgements**

This research was funded by a grant from the W. M. Keck Foundation, Research Experience for Undergraduates, W881-106373, and the Natural Science Division of Pepperdine University. We’d like to thank Dr. Stephen Davis for his continued support and guidance in our research. We’d also like to thank Victoria Lekson for her guidance in the our research’s conductance.