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Mechanical Strength and Hydration Level of Heteromeles arbutifola and Eriogonium Cinerium

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Abstract

The purpose of this study was to explore the hydration levels and mechanical strength of two species native to the same area: the dry Mediterranean region of the Santa Monica Mountains. The plants in this area must make adaptations to dry and arid climates, and We will compare how they stack up against each other in terms of drought resistance. Using Hollywood (heteromeles arbutifola) and Buckwheat (Eriogonium cinerium) we studied the different hyration levels and mechanical strengths and compared them. Both *H. Arbutifola and* the *E. Cinerium* are expected to mechanically stronger when hydrated.. We also expect the *H. Arbutifola* to be less affected by the lack of hydration than the *E. Cinerium.* Our methods for this experiment include taking samples of each plant, and hydrating half of each species and allowing the other to dry out for four hours. After this is done, we used the instron mechanical strength machine and the pressure chamber to collect data on the mechanical strangth and hydration levels of the leaves. We then compared the data statisically and our results showed that the hydrated Buckwheat and dehydrated Buckwheat were not significantly different in their mechanical strength. And that dehydrated Hollywood and hydrated Hollywood do not have significant mechanical strength difference. Finally the hydrated Hollywood and dehydrated Buckwheat do not have significantly different water pressures.

Introduction

This research is extremely important to the knowledge of how plants adapt to drought and arid climates. The Santa Monica Mountains are a natural wonder because its plants have adapted certain stratigies to survive hot winds, high fire frequency, and very little rainfall. We will investigate the effects of climate change in weather patterns on plant health, and how lack of precipitation will affect mechanical strength of chaparral and coastal sage species. With global climate change comes a shift in precipitation patterns. Often plants don't get as much rainfall as they are used to and they are dehydrated. We would like to investigate how these weather pattern changes can affect the strength of the leaves of species in this area in different ways. Drought may affect one plant more than another, why is this? This opens up a lot of questions that are important in this field.

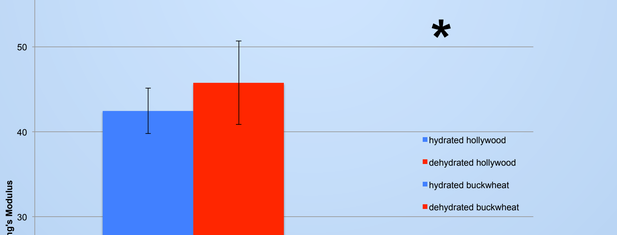
Methods

- We will obtain 10 branches from each species, making sure to gather from several different trees and label them appropriately. We got our branches from Pepperdine University, in an area near the Theme Tower on campus.
- In the lab, we will place half the branches of one species in water, and the other half will recieve no water. We allow them to sit for several hours
- We will measure the mechanical strength with the instron and the hydration level with the pressure chamber of one leaf from each branch.



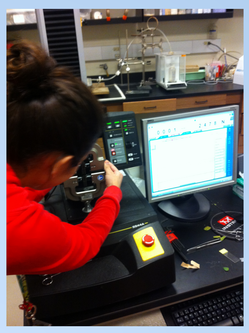
Species

Heteromeles arbutifola: aka Hollywood, Christmas Berry, or Toyon; it is a species of chaparral
Eriogonium cinerium: aka Buckwheat

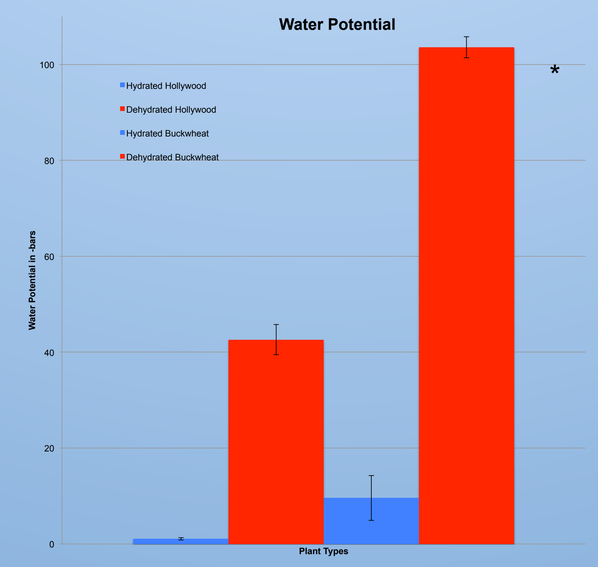


Materials

Pressure chamber
Instron Mechanical strength Machine

Results



On the above graphs: Hollywood is on the left and Buckwheat is on the right. Though the Mechanical strength was significant comparing within the same species, the plants were not significantly different from one another

Hypothesis

- Buckwheat (*Heteromeles arbutifola)* leaves will be mechanically stronger when they are more hydrated.
- (*Eriogonium cinerium)* Hollywood leaves will be mechanically stronger when they are more hydrated.
- The mechanical strength of Hollywood (*Heteromeles arbutifola)* leaves will be less affected by lack of water than the Buckwheat (*Eriogonium cinerium)* leaves

Discussion

When we compared the data statisically our results showed that the hydrated Buckwheat and dehydrated Buckwheat were not significantly different in their mechanical strength. Dehydrated Hollywood and hydrated Hollywood do not have significant mechanical strength difference, the hydrated leaves did tend to have a higher mechanical strength than did the dehydrated Buckwheat (Kristpher). Finally the hydrated Hollywood and hydrated Buckwheat do not have significantly different water pressures. However, the dehydrated buckwheat was too dry for the pressure chamber to measure precise water pressure.
8 T tests were performed on the data:
Mechanical Strength:
-Hydrated Hollywood v Hydrated Buckwheat: p=0.004695905
-Dehydrated Hollywood v Dehydrated Buckwheat: p=3.50688E-05
-Hydrated Hollywood v Dehydrated Hollywood: p=0.282040647
-Hydrated Buckwheat v Dehyrdated Buckwheat: p=0.279291709
Water Potential:
-Hydrated Hollywood v Hydrated Buckwheat: p=0.106276776
-Dehydrated Hollywood v Dehydrated Buckwheat: p=1.2937E-07
-Hydrated Hollywood v Dehydrated Hollywood: p=5.6033E-07
-Hydrated Buckwheat v Dehyrdated Buckwheat: p=4.29666E-08

Conclusion

Conclusion:
1. Hypothesis 1 was false because though the water potential of Hollywood did become significantly drier, but the mechanical strength of the Hollywood was not significantly affected.
2. Hypothesis 2 was false because the water potential of buckwheat did become significantly drier, but the mechanical strength of the buckwheat was not significantly affected.
3. Hypothesis 3 was also false because neither of the mechanical strength were significantly affected.

Sources

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