1-1-2010

Effect of Petiole-to-Branchlet Angle on Tensile Stress and Tensile Strength in Heteromeles arbutifolia

Matt W. Andrus
Pepperdine University

Anthony P. Lisankis
Pepperdine University

Valen C. Anderson
Pepperdine University

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

Part of the Plant Biology Commons

Recommended Citation
http://digitalcommons.pepperdine.edu/sturesearch/24

This Article 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 All Undergraduate Student Research by an authorized administrator of Pepperdine Digital Commons. For more information, please contact Kevin.Miller3@pepperdine.edu.
Effect of Petiole-to-Branchlet Angle on Tensile Stress and Tensile Strength in *Heteromeles arbutifolia*

Matt W. Andrus, Anthony P. Lisankis, Valen C. Anderson Pepperdine University, Malibu, California

### Abstract

*Heteromeles arbutifolia* an important chaparral species of southern California, is a food source for mule deer (*Odocoileus hemionus*). This predation has become more pronounced as the climate shifts to hotter, drier, and longer summers. Other species that the deer normally feed on cannot survive these harsh conditions, while *Heteromeles arbutifolia* is able to persevere. (Letourneau, 2004) We decided that there must be mechanisms involved in the petiole of leaves to keep them from being pulled off by deer and strong winds. Our group hypothesized that as the angle between the petiole and branch increased, the tensile strength of the petiole would decrease. Testing was completed on an Instron® tension tester to gather data about the petiole’s strength. The subject of this experimentation was adult *Heteromeles arbutifolia* (Toyon) from the Pepperdine campus in Malibu, California. By measuring both natural and anthropogenic angles we were unable to see any correlation between the angle and Modulus of strength. In future studies perhaps more samples would be able to tease out a trend unseen in the data points collected by our group. The petiole’s resistance to pulling may also be more dependant on other evolutionary factors, such as petiole diameter and fibrous content.

### Materials/Methods

*Heteromeles arbutifolia* leaves attached to branchlets were gathered from the population on Pepperdine campus in Malibu, CA for testing. Tensile testing was done on a Instron® Universal Testing Machine to gather data about the strength of the petiole.

### Data/Results/Discussion

The data collected from the 34 samples tested did not show any significant trends. This can be seen from the data displayed in Figure 1. This was simply one of the measurements that was gathered, but all of the graphs display the same random data, from which no trends can be teased. From this data, it was determined that there is no correlation between the petiole-to-branchlet angle and the tensile strength of the petiole in *Heteromeles arbutifolia*. Our group still feels there may be some correlation, however our data does not support this. Perhaps the limitation in time and samples has something to do with no trends emerging. In an ideal future experiment, many more samples would be tested, preferably from a larger population. It is also possible that there is no correlation, as the data suggests, and the strength is derived from another factor, such as transverse area of the petiole, or fibrous composition in the petiole and branchlet.

### Conclusion

The Modulus of an adult *Heteromeles arbutifolia* petiole varied between 180 – 1566 N/mm². The average transverse area of a *Heteromeles arbutifolia* petiole varied 1mm² - 5.94mm². The natural angle of leaves on a *Heteromeles arbutifolia* varied between 30° - 75°, with 50° being the most abundant organic angle. By measuring both natural and anthropogenic angles we were unable to see any correlation between the angle and Modulus of strength. In future studies perhaps more samples would be able to tease out a trend unseen in the data points collected by our group. Additional studies could also be conducted to compare the difference in Modulus of strength between organic angles and anthropogenic angles. Future studies measuring the modulus of plants that are being exposed to different environmental stresses might provide data exposing how petiole strength correlates to aforementioned environmental stresses.

### Literature Cited


### Acknowledgements

The Botany Laboratory at Pepperdine University in Malibu, California. Dr. Stephen Davis.