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Elevation's Effect on Malosma laurinais Leaf Size

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Abstract

Our hypothesis was that the average leaf size of *Malosma laurinais* would be different at high and low elevations due to the variance in temperature and solar radiation. This is especially relevant considering the severe drought conditions of California. Testing the factors of growth for chaparral may help ecologists to better understand how the plants cope with abnormalities in the ecosystem. Our study examined variance in *Malosma laurinais* leaf length, width, area, curvature, and thickness at high elevation (610 meters to 629 meters) and low elevation (27 meters to 53 meters) located along Sycamore Canyon. Differences were only significant in leaf length and area. The least amount of variance was found in thickness. All other conditions had a higher mean value in plants at lower elevation. Our research confirmed our hypothesis for observable differences in leaf size at high versus low elevations, based on the changes in length and area of *Malosma laurinais* leaves.

Introduction

The *Malosma laurinais* an important species of Chaparral in the Santa Monica Mountains of California and studying it in depth is beneficial to science in better knowing it and the environment it lives in. The environment of the Santa Monica Mountains have many variables that affect the *Malosma laurinais,* but our research focused specifically on elevation and what changes occur to the leaf size. We hypothesize that *Malosma laurinais* is affected by elevation, caused by temperature and solar radiation affecting the chaparrals leaf size. We measured the size (width laid flat and curved, length, thickness) of the leaves on mature Laurel Sumac *Malosma laurinais* at a low elevation, and then at high elevation in the Santa Monica Mountains. Our ideas for how we specified the leaf and plant selection in our study were consistent and similar with previous methods of measurements (Ackerly et al. 2001). Using these tests we recorded the results to discover if elevation had any effect on the leaf.

Description of Study Site

To test what the effects of elevation are on the *Malosma laurinais*, we chose two test sites. One test site at 27 to 53 meters at the Sara Wan Trailhead Corral Canyon national park, being our location of low elevation in the Santa Monica Mountains which is approximately 0.2 miles from the ocean. Our second test site was at 610 to 629 meters at the top of Solstice Canyon national park, being our location of high elevation just 4.5 miles inland from the Corral Canyon location. We chose sites that are horizontally close to get similar weather conditions but laterally as different as possible to get the most difference in elevation as possible.

Study Site, Methods, and Materials

The instruments we used to record the length, width, and thickness were a dial caliper and ruler which both measure in centimeters. We used a barometer to measure elevation in feet. In our testing we measured two leaves on twelve different plants at each site. One leaf was measured from the top portion of the plant, the other from lower portion. When choosing what leaf to measure we kept the location consistent by choosing approximately eight leaves from the top of the branch and only measuring leaves on the south side of the plant, similar to research on typical plant habitat exposure (Hochberg 1980). We measured and recorded each leaf's width of its natural curvature, width laid flat at its widest point, and total length from base to tip.

Results

Table 1. Average values for leaves at high and low elevations with standard error and P values. Significant differences are shown by * = $P < 0.05$.

Variables	High Elevation	Low Elevation	P value
Length	5.87 ± 0.24	7.25 ± 0.39	0.006*
Width	2.84 ± 0.12	3.20 ± 0.15	0.074
Area	16.85 ± 1.20	23.66 ± 2.28	0.015*
Curvature Index	0.359 ± 0.036	0.403 ± 0.026	0.326
Thickness	0.386 ± 0.009	0.388 ± 0.010	0.905

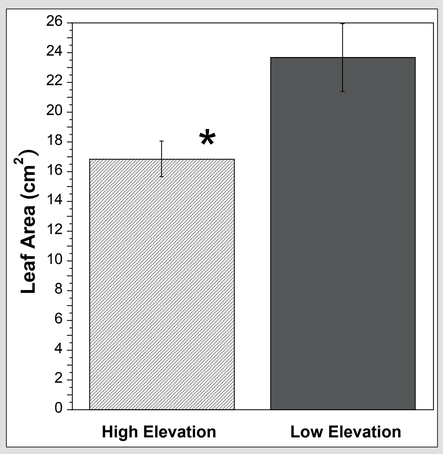

Figure 1. Leaf area (cm) of plants at high and low elevation. 12 different plants at each site were selected and data was collected for two leaves per plant. Area was calculated from length and width measurements. High elevation ranged from 610 to 629 meters and low elevation ranged from 27 to 53 meters. Bars represent ± 1 S.E. Significance between high and low elevation plants is shown by * = $P < 0.05$.

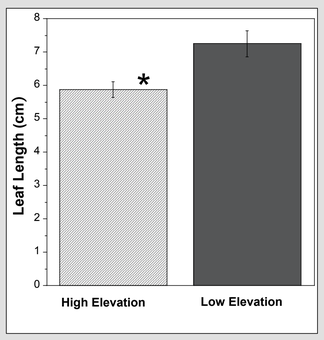

Figure 2. Leaf length (cm) at high and low elevations. Significant difference is shown by * = $P < 0.01$.

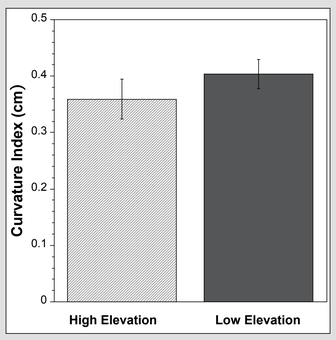

Figure 5. Curvature index (cm) of leaves at high and low elevation. Values calculated from curvature and width data. Index values *= 1 - (curve/width)*.

Discussion

Because of the research we conducted it is clear the higher the elevation, the more the *Malosma laurinais* lacks in producing longer, wider and overall larger area leaves and in turn the lower the elevation the leaves get longer, wider, and overall larger area. These findings are significant in knowing the health and size of the Chaparral. We have support that the Laurel Sumacs leaf size is affected by the elevation in which it grows in the Santa Monica Mountains. David Ackerly explains that this issue relates to processes that affect the ecology and evolution (Ackerly 2004). This relates to our findings in that no part of the environment can be left unstudied in having an effect on the native Chaparral. We can propose with further research that the larger leaves are significant because they are possibly subject to better living conditions, which relates to the burn patters and intensities of higher elevation wild fires compared to lower. Other studies can be done on alternative factors of leaf size from the worldwide leaf index (Wright et al. 2004).

Conclusions

- There is variance in leaf size from high and low elevation.
- Therefore, our hypothesis was correct in that the variables at different altitudes affect the growth of *Malosma laurinais* leaves.
- The amount of water available for the plants depends on location and plants at low elevation benefit from this resource.
- Light is not a significant factor based on elevation because the plant species is generally equal in height and the curvature index shows little variance.
- Thickness does not vary between the leaves at each test site.

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