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Effects of Shading on Post-fire Seedlings of Laurel Sumac (Malosma laurina) in the Santa Monica Mountains

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Abstract

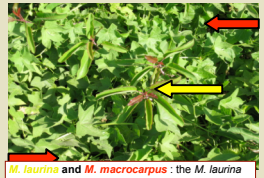
The interactions between post-fire plants is crucial directly after fire. A recent fire on Pepperdine campus allowed for a study to be performed on these interactions. The dominant chapparal plant, *Malosma lauraina*, laural sumac, both re-sprouts and grows from seeds after fire. *Marah Macrocarpus*, wild cucumber, grows rapidly after rain following a fire. Some *M. lauraina* seedlings end up under the *M. Macrocarpus* yet survive. This study aimed to find differences between those seedlings interacting with *M. Macrocarpus* and those that are not. Three groups of specimen were used. One control group grew in the sun, one control group in the shade of *M. Macrocarpus*, and one experimental group that began growing in the shade but was then exposed to sunlight when the wild cucumber was removed.

The data showed that none of the groups had a significant difference in growth rate but did show a significant difference in height. The light levels varied across all groups except the experimental and control shade groups. Although there were significant differences in stomatal conductance between the experimental and control groups, there was no significant difference when conditions for the experimental was changed, nor was there a significant difference between the two control

Experimental seedlings: some of the seedlings directly after the wild cucumber was cut back. Each experimental group was made of six seedlings in two different sites.

Study Site: Our site was located on the Pepperdine Campus in Malibu California in the Santa Monica Mountains. A fire swept through this area a few months previous.

***M. Laurina* seedlings:** three specimens located under the shade of *M. macrocarpus*



M. laurina **and** *M. macrocarpus* : the *M. laurina* resprouts are larger and can grow above the the *M. macrocarpus*

Materials and Methods

We set up our experiment with three groups of seedlings: the experimental group, the sun control group, and the shade group. Both the experimental and shade control groups were in areas covered with wild cucumber, while the sun control group was away from any large plants that would provide significant shade. Each group was divided into two locations with three seedlings in each location.

We measured the seedlings': height, from the soil to the tip of the shoot, stomatal conductance, gs, the rate at which the plants are respiring which correlates with photosynthetic activity, and the available PAR, Photosythetically Active Radiation. We used a small ruler to measure the height, a POROMETER NAME HERE, which measures the water vapor given off by the leaf clamped into the instrument head as the leaf gives off water vapor which raises the humidity inside the chamber. We measured PAR using an LI-80 Sunflect Ceptometer. This instrument measures the photons which hit the sensor per area of sensor used. We took one PAR measurement for the sun control group because each of the three seedlings in each group was in full sun with no shade to cause differentiation. We measured the PAR three times for the experimental and shade control groups because the varying levels of shade for each seedling in the group cased by the irregularity of the wild cucumber growth. We took the average of these three measurements for the PAR of the group.

After two weeks of taking measurements of the seedlings in their original environment we cut back the wild cucumber around the experimental groups to simulate the wild cucumber dying back and began to take the same measurements as previously in order to determine the seedlings response to this sudden exposure to higher levels of sunlight. We maintained the same methods of measurement for all groups.

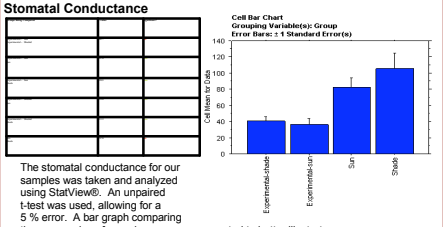
Introduction

Chaparral is a type of vegetation characterized by evergreen sclerophylous shrubs. They are found in Mediterranean climates, which have mild winters, dry summers, and frequent wild fires. These fires, lead to the destruction of old existing chaparral, and emergence of a new generation of plant life and post-fire endemics (Conard). Lately Southern California has seen an increase in the fire frequency, most caused by humans (Keeley).

Two species of plant that exist in the Santa Monica Mountains, include *Malosma lauraina* and *Marah Macrocarpus*. *M. lauraina*, Laurel Sumac, is a dominant type of chaparral vegetation that is a facultative sprouter, meaning that it forms resprouts from a root crown and also produces seedlings after a fire (Davis 86). Previous studies have shown that these post- fire seedlings have about a 0.1% survival rate (Davis 88). *M. macrocarpus*, Wild Cucumber, is a trailing vine with a huge fleshy root, and distinctive bright green prickly fruits. It is one of the first plants to appear after a fire due to its extremely large root. *M. macrocarpus* first appears when it rains after a fire, and then dies back as the summer months approach (Dale).

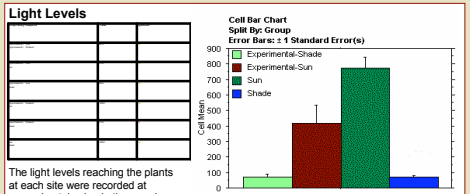
We undertook this study to determine the effect that one plant species could have on the survivorship and physiological traits of another, in a post- fire chaparral environment. We chose *Marah macrocarpus* and *Melosma lauraina* for their relative abundance and the observation of what appeared to be a relationship between the two species. We noticed *M. Lauraina seedlings* growing underneath the shady outgrowth of the *M. macrocarpus*. We hypothesized that these seedlings would grow taller, due to their need to obtain sunlight, and that they would have lower rates of photosynthesis, compared to seedlings that were out in the open. As the *M. macrocarpus* died back and the protected seedlings were exposed to light we predicted that growth

Stomatal Conductance



The stomatal conductance for our samples was taken and analyzed using StatView®. An unpaired t-test was used, allowing for a 5 % error. A bar graph comparing the mean values for each group was generated to better illustrate the experimental differences.

Light Levels



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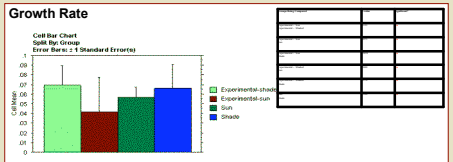
Growth Rate



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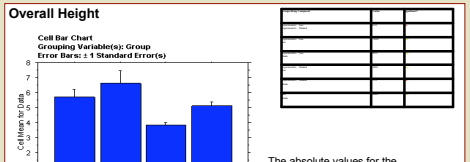
Overall Height



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The absolute values for the heights recorded were also

Again, an unpaired t-test was used, and again, a bar chart was generated using the mean values

for each group.

Conclusions

Conductance:
-No significant difference between the experimental group before and after conditions changed
-No significant difference between control groups (Sun and Shade)
-Significant difference between experimental groups and controls

Light Levels
-All groups were significantly different except for the experimental and control shade

Growth Rate:
-No significant difference between any group

Absolute Height:
-Significant differences between all groups except for both experimental and the control shade.

Marah macrocarpus: the fruits of a *M. Macrocarpus* are very distinctive

Literature Cited

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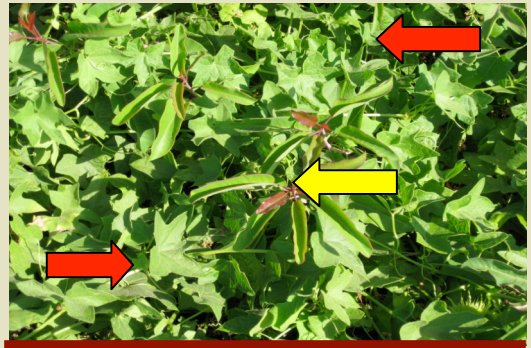

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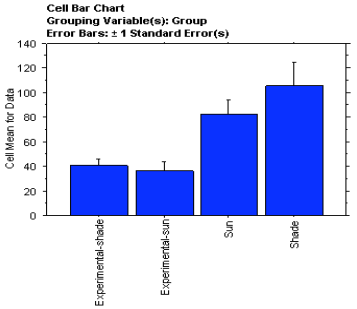

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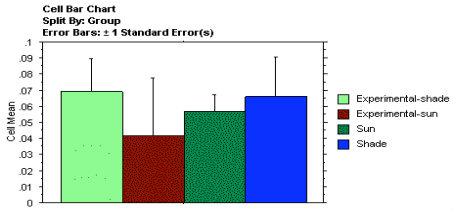

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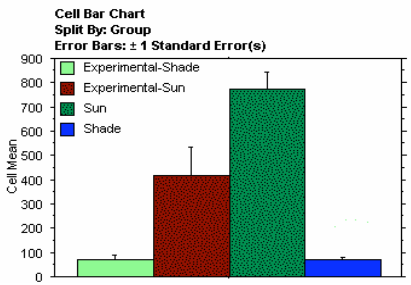

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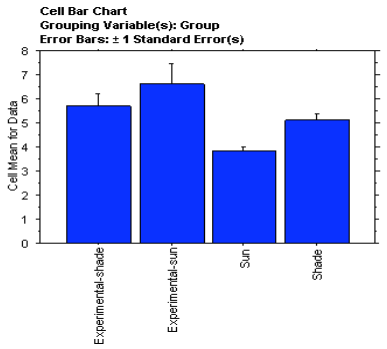

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