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Abstract

The Keeling Curve has displayed an exponential increase in carbon dioxide within the earth's atmosphere since the late 1950's. Scientists have heatedly debated the effects that will occur as a result of this relatively new phenomenon (since the Industrial Revolution of America). We tested the effect of increased carbon dioxide levels on plant life, *Malosma laurina,* in particular. Our experiment involved the application of 400 PPM of carbon dioxide into different specimens of *M. laurina* and 800 PPM of carbon dioxide into the same specimens. We then recorded the rate of photosynthesis, conductance results, and levels of internal carbon dioxide. Results displayed that plants experience a higher rate of photosynthesis when they are exposed to higher levels of carbon dioxide. This information is vital to the scientific community because both scientists and botanists can utilize this information to produce plants more efficiently.

Introduction

Is excessive carbon dioxide intake unhealthy for plants? This question has plagued the scientific community and has also been exceedingly controversial. Since the development of the Scripps CO_2 program by Charles David Keeling in 1956, the amount of carbon dioxide in the atmosphere above Hawaii's Mauna Loa (which is said to possess the cleanest air) has been observed. The carbon dioxide levels have increased dramatically since the beginning of observations, which is why we wished to observe how the influx of carbon dioxide affected the environment.

Plants in general survive based upon a photosynthetic model of operation. They absorb carbon dioxide and then convert it into oxygen, along with a few other byproducts. *Malsoma laurina*, like all other plants, operates on the same principle.

Our hypothesis stated that *M. laurina* would produce a more efficient rate of photosynthesis if the tested specimens were to experience higher levels of carbon dioxide. The reasoning behind this hypothesis stemmed from the assumption that because plants utilize carbon dioxide in the photosynthetic process, *M.laurina* should experience photosynthesis more acutely if it has more carbon dioxide to convert into oxygen.

We tested our hypothesis by pumping varying levels of carbon dioxide into multiple *M. laurina* specimens and then recorded their rate of photosynthesis using the Li-Cor 6400 Gas Exchange System. We then compared the results and analyzed the data extensively.

Materials and Methods

The experimental approach for testing our hypothesis was exceedingly effective in determining whether or not varying carbon dioxide levels affected the photosynthetic rates of multiple *Malosma laurina* specimens. Firstly, we identified six different *M. laurina* plants on the campus of Pepperdine University in Malibu, California. They were all approximately within the same vicinity and the same elevation. When deciding which leaves to experiment with, we made sure to test the leaves that were either completely or at least partially in the sunlight. The leaves were also all approximately the same size and color.

After we identified our test subjects, we used the Li-Cor 6400 Gas Exchange System to apply varying levels of carbon dioxide to one leaf of each of the six plants. Initially, we started out at 400 PPM of carbon dioxide and then we recorded the photosynthetic rate, conductance in the stomata and the internal carbon dioxide. After that, we applied 800 PPM to the leaves and recorded the same data. Unfortunately, one plant was primarily covered by shade and it produced vastly different results than the other leaves.

This experiment is easily repeatable because there is no shortage of *M. laurina* in California, it is inexpensive to repeat, and it does not harm the environment in any way at all. The controls in our experiment were the consistent levels of sunlight, the constant temperature of the day, the unchanged plant species, the same geographical location and elevation, and constant levels of carbon dioxide that we applied to the specimens. The data were all analyzed and interpreted correctly because the results directly proved our hypothesis.

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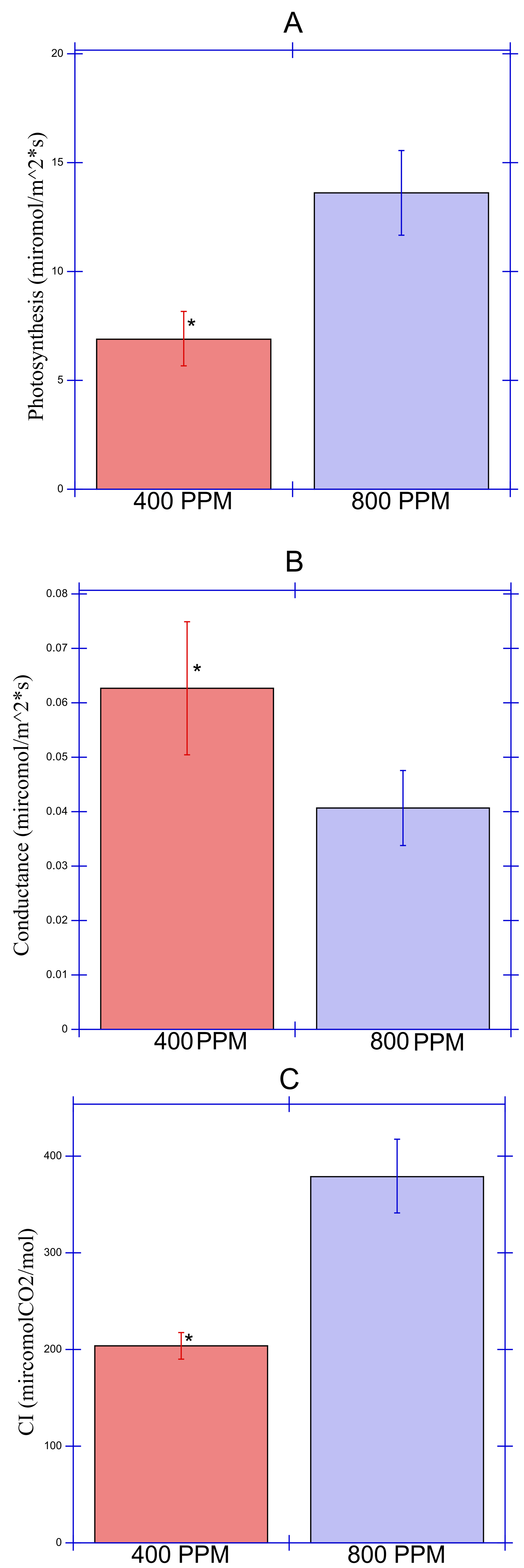

Figure 1. Physiological response of *Malosma laurina* leaves to a doubling of atmospheric carbon dioxide concentrations, increasing from ambient carbon dioxide of 400 PPM to 800 PPM. A) increasing rate of photosynthesis, B) decrease in stomatal conductance to water vapor diffusion, and C) increase in carbon dioxide concentrations within the leaf (CI). An asterisk, *, represents significant difference between the 400 and 800 PPM of carbon dioxide by student's t test at P < .05. Error bars on symbols represent ± 1 SE and n=6.

Discussion

- Excessive carbon dioxide proved to not have any negative effects on the specimens
- Photosynthesis is crucial to plant life and increased carbon dioxide helps to expedite the process
- Scientists and botanists can utilize this information to produce more plants at a faster rate
- This information can help improve plant life all throughout the world

Conclusion

- Overall results showed that increased levels of carbon dioxide produced higher rates of photosynthesis, slightly lower conductance results, and higher levels of internal carbon dioxide
- The photosynthetic rate was approximately doubled when 800 PPM of carbon dioxide was applied to the specimens
- Conductance showed only a slight decrease in levels when 800 PPM of carbon dioxide was applied.
- Internal carbon dioxide displayed a steep increase when 800 PPM of carbon dioxide was applied.

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