Reduced Ability of Drought-Effected Plants to Assimilate Carbon Dioxide

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Reduced Ability of Drought-Effected Plants to Assimilate Carbon Dioxide

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Abstract

As a group, we hypothesized that plants affected by the drought will absorb less CO2 compared to those that are irrigated regularly by Pepperdine University. In order to test this out we used the Carbon Dioxide CO2 transmitter which analyzed the carbon dioxide levels and conduction of three leaves that are under the drought and three leaves that are fully irrigated. The results were outstanding. As we hypothesized, the irrigated leaves had significantly higher CO2 and photosynthesis values than the leaves that were in the drought. The results are clearly reflected in the data, and consistent with the initial hypothesis. The only surprising aspect was the size of difference of CO2 levels between two types of plants (irrigated and dried).

Materials and Method

The objective of this research is to examine the comparison between CO2 intake of a Pepperdine’s black sage leaves in (1) the absence of drought and (2) in current drought. By using the Carbon Dioxide CO2 transmitter also known as the Li-Cor Portable Photosynthesis System, we measured, analyzed, and monitored the amount of carbon dioxide being respired and transpired by leaves in different environmental conditions: ones that are irrigated, and others that are not. In order to ensure accuracy to support our hypothesis, we collected data from three dry (in drought) leaves and three irrigated (absent from drought) leaves. Both types of leaves were found on Pepperdine University campus near the cross tower.

Discussion

In this research project we validated our hypothesis. The results agree with the literature in the sense that the leaves undergoing a drought had significantly higher transpiration of CO2. As stated by Dr. Long, the high concentration of CO2 caused by the drought has a strong correlation to climate change. We have proven by using the scientific method, that the plants that are well irrigated can help prevent global warming, as confirmed by our sources.

Conclusion

The contrasting findings of CO2 intake from dry and irrigated black sage leaves confirmed our hypothesis and provided good framework to better understand that plants in the current drought have insufficient source of water and take in less carbon dioxide than plants that are irrigated and have sufficient supply of water. We have discovered how this drought is not only affecting the plants but also the concentration of CO2 which causes intensification in the current problem of global warming that we are facing. We believe that the next step of this research is to investigate what has caused the California drought and the preventive measures that we can take in the future.

CO2 Respiration and Transpiration

Result

We first measured the current CO2 concentration in Malibu, which amounted to 398. Then we measured the amount of CO2 generated from the transpiration of the plant. In the case of the irrigated plant, we noted that there was a negative impact of 7.3 CO2 and photosynthesis of positive 9.25, all in all, causing a positive impact in the environment. Because the plant was irrigated, the leaves reduces the amount of CO2 concentration in the air. In the case of the non-irrigated black sage plants the case was completely different. There was a CO2 inflow of 399.8 and a CO2 outflow of 399.2 resulting a difference of negative 0.6 CO2 and a negative impact of 7.3 CO2 and photosynthesis of 9.25, all in all, causing a negative impact in the environment. Because the plant was not irrigated, we noted that there was a negative impact of 7.3 CO2 and photosynthesis of 9.25, all in all, causing a negative impact in the environment.

Acknowledgement

This research was funded by the Natural Science Division of Pepperdine University.

Literature Cited


Table

<table>
<thead>
<tr>
<th></th>
<th>Healthy leaf #1</th>
<th>Healthy leaf #2</th>
<th>Healthy leaf #3</th>
<th>Dry leaf #1</th>
<th>Dry leaf #2</th>
<th>Dry leaf #3</th>
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<tbody>
<tr>
<td>CO2 going into the leaf (µmol mol⁻¹)</td>
<td>399</td>
<td>399.9</td>
<td>399.9</td>
<td>399.8</td>
<td>399.6</td>
<td>399.8</td>
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<tr>
<td>CO2 coming out of the leaf (µmol mol⁻¹)</td>
<td>392.3</td>
<td>394.7</td>
<td>393.1</td>
<td>399.1</td>
<td>399.7</td>
<td>399.2</td>
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<td>Concentration (µmol mol⁻¹)</td>
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<td>370</td>
<td>360</td>
<td>374</td>
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<tr>
<td>Photosynthetic rate (µmol m⁻² s⁻¹)</td>
<td>9.25</td>
<td>1.71</td>
<td>2.7</td>
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<td>-0.274</td>
<td>-0.163</td>
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<td>stomatal conductance (mmol m⁻² s⁻¹)</td>
<td>0.206</td>
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<td>0.163</td>
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