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Photosynthesis lab write up

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Varying Light Levels and the Effect on the Dissolved Oxygen Output of *Pseudokirchneriella subcapitata* in Photosynthesis

Introduction- Photosynthesis is a cellular process where plants, and algae such as *Psuedokirchneriella subcapitata*, convert sunlight and other natural substances into sugar. The chemical formula for this process is $6CO_2 + 6H_2O + \text{energy} \rightarrow C_6H_{12}O_6 + 6O_2$ (Carlos Correa-González J). As seen above in the photosynthesis chemical formula, the plants, or in this case algae, absorb carbon dioxide and release oxygen into their environment through sever cellular cycles (Yamazaki H). So, to measure the rate that the algae are doing photosynthesis, we can measure the amount of dissolved oxygen in the algae's environment. Along with this method of measuring the rate of photosynthesis we can see how varying light intensities will affect the photosynthesis rate (Dana C). Our hypothesis was as light intensity increases, so will the production of dissolved oxygen, indicating an increased rate of photosynthesis.

Methods- Have a total of 42 bottles filled up half way with a water and algae mixture with a stir bar. Next cover the dissolved oxygen probes with a fresh membrane to insure accurate readings are being taken. Measure the starting dissolved oxygen in the bottles using the measurement unit mg/L. Following the initial readings of dissolved oxygen, place six of the bottles in black paper

bags to insure no light gets in (making this the control group). Then place the remaining thirty-six bottles in the light array in varying distances (closer to the lights/high light intensity and farther away from the light/low light intensity). The light intensities should be around 100 µm mol photons/m2/s for the low light intensity group and 300 µm mol photons/m2/s for the high light intensity group using a LI-250 COR Light Meter with a one-thousand W LED light. After this let the bottles sit in the light, or paper bags depending on the group, for sixty minutes. When the sixty minutes are up, remove the bottles from the light and paper bag. Then quickly measure the dissolved oxygen using Logger Lite Pro computer software to get your end results in mg/L. With the end results, perform an ANOVA single factor T-test to find if the results lie in the rejection region.

Results-

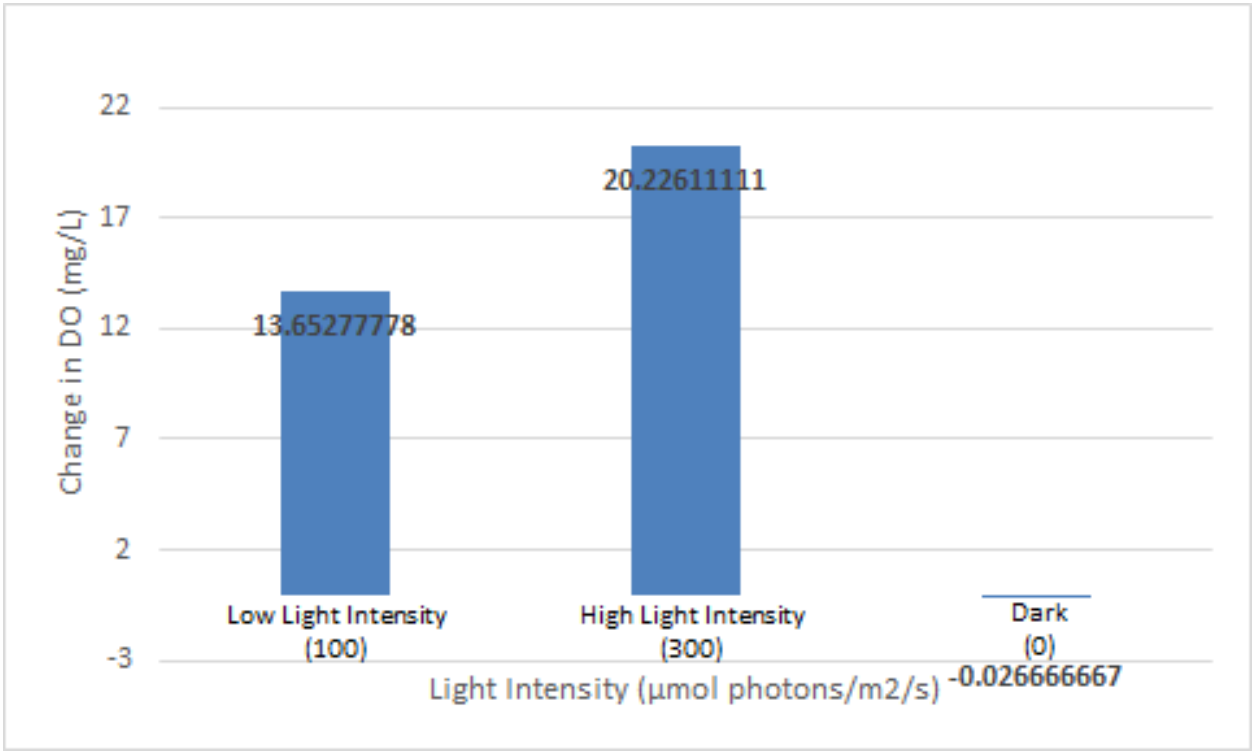

Figure 1: shows the mean change in dissolved oxygen in mg/L with the dark group (the control group, paper bag bottles) having a negative change in dissolved oxygen, the low light intensity group having the middle change in dissolved oxygen, and the high light intensity group having the most mean change in dissolved oxygen. The chart shows a trend that the greater amount of light the algae was exposed to, the greater amount of dissolved oxygen was made.

Discussion- With our hypothesis, as light intensity increases, so will the production of dissolved oxygen, indicating an increased rate of photosynthesis, was supported by out data findings. First of all, our ANOVA single factor test showed the P-value to be 5.50 x 10E-22 which was much smaller that our critical value of 0.95. this shows that there were no statistical discrepancies in our data. With the data being sound, we can see that the mean dissolved oxygen in the high light intensity groups, being 20.226 mg/L, were much higher than the low light intensity group, 13.6527 mg/L, and especially higher than the dark (control) group, -0.026 mg/L. what this all means is that the high light intensity group had more photosynthesis occurring, as oxygen is the byproduct of photosynthesis so the more dissolved oxygen there is the more photosynthesis occurred, than the low light intensity groups.

The use of the control group in this experiment was vital to show and give us a base line reading for the amount of photosynthesis occurring while no light was helping it speed up. Without the knowledge of that little to no photosynthesis would occur without light helps prove that the light intensity was the main determining factor in photosynthesis production rate (measured through the dissolved oxygen).

References

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