Null hypothesis: Photosynthetic efficiency of Aiptasia pallida is not influenced by exposure to nicotinamide riboside (NR)

A pilot Study

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Introduction

Coral reefs are in danger due to climate change, pollution, and other human activities. Stony corals are characterized by animal polyps often with algae living in its' tissue. Coral reefs provide a myriad of ecosystem services, including habitat as well as storm surge protection. Several factors threaten coral reefs, including climate change, ocean acidity, and coral bleaching. This study aims to investigate how nicotinamide riboside influences photosynthetic efficiency in coral model A*iptasia pallida*, with implications for understanding mechanisms of coral bleaching.

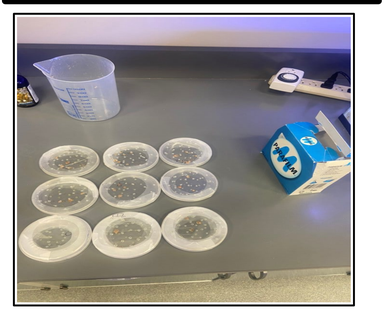
Methodology

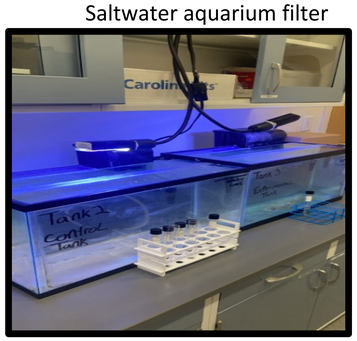
- Two tanks were used (Control and Experimental tank)
- Three Aiptasia were added to 5 perforated petri dishes in both control and experimental tanks
- 1 capsule of NR was added to the experimental tank over a two-week period
- PAM Fluorometer used to measure photosynthetic efficiency value (between 0 and 1) for each Aiptasia at the conclusion of the experiment

Materials

Brine Shrimp
Reef zooplankton
Forceps
NAD+ Supplement
Spectrophotometer
Pam Fluorometer

20 gallon (x3)
Aiptasia Aquarium tank lid
aquarium thermometer
Aquarium heater
UV Aquarium light
Fluorescent light adapter
Perforated Petri dishes
Mesh bags (clear/white)
Reef master test kit
Saltwater master test kit
Aquarium salt
Salinity refractor
Saltwater aquarium filter





Results

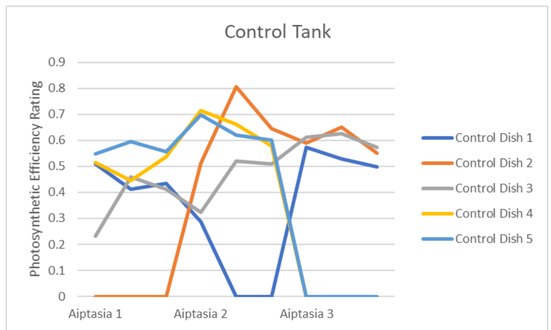
The t-test results in a t-statistic of approximately **-2.198** and a p-value of **0.031**. This p-value is less than the significance level of **0.05**, suggesting that there is a statistically significant difference between the average PAM fluorometer readings of the control group and the experimental group. This indicates that the addition of nicotinamide riboside had a statistically significant effect on the photosynthetic efficiency of Aiptasia pallida. Therefore, the null hypothesis is refuted.

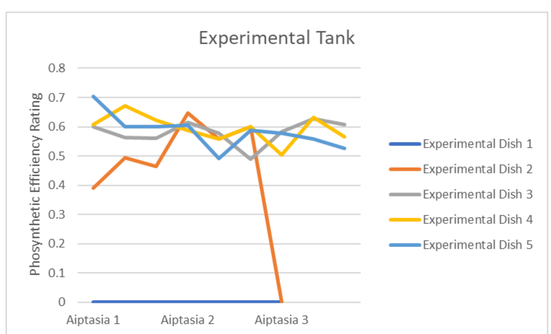
A statistical power test resulted the power of approximately **0.612**. Therefore, is a **61.2%** chance that the test correctly rejects the null hypothesis when the alternative hypothesis is true, which is considered moderate power. Our baseline power expectation of 0.8 (80%) was not reached, as this might be addressed in future studies and higher sample size.

Of note, that experimental tank illustrated a most consistent pattern with less fluctuation.

Standard deviation for Control Tank: .21

Standard deviation for Exp. Tank: .06





Aiptasia Pallida

Aiptasia pallida, a type of sea anemone, shares significant biological and ecological characteristics with coral species, making it an excellent model for studying coral biology. The symbiotic relationship between Aiptasia and dinoflagellates mirrors that of corals and their symbionts, which is critical for understanding the energy dynamics within coral reefs.

Conclusion

The study examined how Nicotinamide Riboside (NR) supplementation interacts with Aiptasia pallida ability to facilitate photosynthesis, aiming to shed light on potential sirtuin activation and it's role in coral bleaching. The results of this preliminary study were that there was a statistically significant difference between the NR supplemented tank and the control. However, statistical power was relatively low, indicating more research with a higher sample size is needed. The findings suggest that NR supplementation and thus potential sirtuin activation could assist in our understanding of bleaching mechanisms. Also, the standard deviation of the experimental tank suggests the photosynthetic efficiency of the experimental tank was more consistent. This suggests RN treatment had a stabilizing effect on photosynthetic performance.

Acknowledgements

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Reference

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