Pigment Production in Freshwater Algal Strain Isolated From Wastewater

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Introduction

Carotenoids (red/orange pigments) are used in food additives, vitamins, and fish feeds. The majority of carotenoids used in industry are produced synthetically. This research focuses on inducing natural carotenoid production in a freshwater strain of green algae isolated from wastewater by exposing it to 1.2% NaCl (m/v).

Sustainable Manufacturing Connection

- Manufacturing using algae is environmentally friendly because algae is a renewable resource with a rapid growth rate
- Marginal lands that cannot be used for traditional farming can often be used for algal cultivation
- Algae can be grown with wastewater, providing a natural and low-energy way to remove harmful nitrates and phosphates
- The global market for carotenoids is worth over $1.5 billion (1)
- Research is focusing on ways to more efficiently bring the cost of algal cultivation and harvesting down so as to make algal products more economically competitive

Background

- When this strain of algae was being isolated from the wastewater, it turned orange, proving under certain circumstances it will produce carotenoids
- Previous experiments done with green algae has shown that under physiological stress, such as nitrogen deprivation, high light intensity, and high salinity, some algal strains will produce red pigment (2)

Approach

- Algal strain was isolated from wastewater provided by the Detroit Wastewater Treatment Plant
- Algal strain was introduced into a BG-11 medium
- The samples were aerated and placed on a rotating table
- A NaCl concentration of 1.2% (m/v) was introduced to half of the samples after 10 days of growth
- Daily optical density measurements were taken
- Cell Count measurements were taken starting on the 13th day
- The experiment ran for 24 days

Results

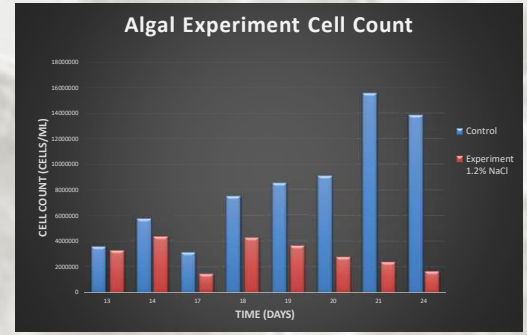

Figure 1 Cell count measurements of the 1.2% NaCl experiment compared to the control

- The desired pigment was not produced
- The samples treated with 1.2% NaCl had significantly slower growth than the control sample
- The algae in the salt samples showed signs of dying off in less than a week after NaCl was added
- When observed under a microscope, the cells in the NaCl samples showed distress, grouping tightly together instead of free floating like the cells not exposed to NaCl

Results Continued

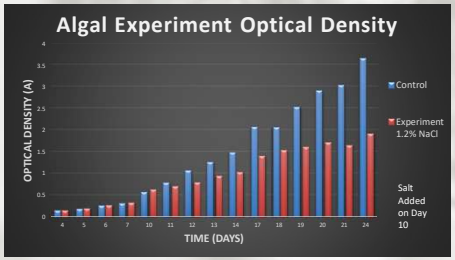

Figure 2 Optical density measurements of the 1.2% NaCl experiment compared to the control

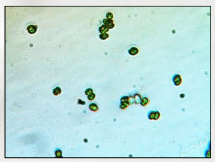

Figure 3 Control cells

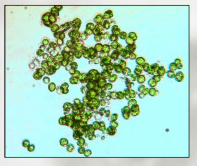

Figure 4 Cells exposed to 1.2% NaCl

Conclusions

When 1.2% NaCl is added to this algal strain it will not produce carotenoids and the algae will exhibit significantly decreased growth.

Acknowledgements

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About Me

I am a biomedical engineering major at Miami University in Ohio.

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