Effects of Lipid Activating Chemical Compounds on the Growth and Production of Fatty Acids and Metabolites in Green Algae

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**Abstract**

This study examines the effects of small molecule lipid activating chemical compounds, discovered from the high throughput screening (HTS) (2) methods of previous FATTT Lab studies on the growth and production of lipids and metabolites in microalgae. For this study, the effects of two lipid inducing chemical compounds from the HTS method were implemented with the microalgae strain Chlamydomonas reinhardtii CC-125. This experiment focused on scaling up to large amounts of culture, approximately 1L. These cultures were grown in specially designed large bioreactors that were able to accommodate for such large volume of algal culture. Algal cells were treated with 10 μM concentration of the chemical compounds at initial time of inoculation. A control set was also implemented to be compared against the treatment conditions. Daily samples of algae cultures were taken in order to analyze growth on a time course-based method in addition. After five days, algal cultures were harvested completely, spun down into pellet form to be freeze dried vacuum by lyophilizer machine. The dried biomass was then recorded and used to carry out analytical techniques to quantify total lipids and metabolites of the algal cells.

**Introduction & Methods**

Green algae have been on the rise as a favorable alternative source in biofuel research. Because of their unique structure, green algae can produce and store high amounts of lipids and fatty acids, which makes them an ideal biofuel alternative. Green algae will produce high amounts of lipid when they are in a nutrient stressed environment that is either lacking certain ions, like nitrogen, or other factors. Algal cells in the nutrient stressed environment can become chlorotic. High throughput screening and discovery of lipid inducing small molecules (2) from previous UNL FATTT Lab studies are being implemented in current algal research to increase production of lipids and growth without the need of nutrient starvation/deprivation or severely reducing biomass of algal cells (2).

**Lipid Activating Chemical Compounds**

- **WD30000**: 2-(3,4-dimethoxyphenyl)-1-methyl-1H-imidazole-4-carboxylic acid ethyl ester
- **WD20067**: 3-(3-adamantyl)-1H-imidazole(propionamide) hydrochloride

**Results**

**Figure 1 - Physical Changes In Bioreactors Overtime**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Control</th>
<th>010</th>
<th>067</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replicate</td>
<td>A, B</td>
<td>A, B</td>
<td>A, B</td>
</tr>
</tbody>
</table>

**Day 3**

![Day 3](image1)

**Day 5**

![Day 5](image2)

**Figure 2A**

Growth of Algal Dry Weight

**Figure 2B**

Growth of Algal Dry Weight

**Figure 3 - Nile Red Fluorescence measured over time.** 20μL of algal culture were placed in the well plate with 1μL of Nile Red dye before being scanned for fluorescence.

**Conclusions**

- The study conducted is still in a work in progress and the current data/information shown is only preliminary data.

**References**


**Acknowledgments**

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