Seaing Green:

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Overview

- Background
- Objectives
- Methods
- Experimental runs
- Results
- Conclusions
- Next Steps
Background

- Biodiesel is a clean alternative fuel for diesel engines produced from animal fat or vegetable oil through a transesterification process.
Background – Biodiesel Use
Feedstock Sources

- Soy
- Canola
- Corn
- Rapeseed
- Animal Fats
**Challenge**

- Challenge in producing Biodiesel is the availability of feedstocks enough to replace petro diesel

<table>
<thead>
<tr>
<th>Types of crops</th>
<th>Soybean</th>
<th>Canola</th>
</tr>
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<tbody>
<tr>
<td>Gal of biodiesel/acre</td>
<td>50</td>
<td>90</td>
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- US diesel demand: ~65 billion gal/year
What is Algae?

• Simple plant-like organism
  – Simple: no leaves, no roots, etc
  – Plant-like: photosynthesis

• Fast Growth, e.g., Chlorella quadruples approximately every 24 hours

Overall Objectives

- Determine the effect of salt on the growth and lipid production of algae strain x1 and x2
- Determine oil content of algae by harvesting and oil extraction
- Determine the effect of CO2 on the algae growth and lipid production
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Methods

• Select algae
• Grow the Algae in a beaker
  – Nutrient
  – Light
  – Air (CO2)
• Monitor Growth
Algae Growth Measurements

- Absorbance readings using a spectrophotometer to measure algae density
- Algae Oil Content using a spectrofluorometer
Us at work...
Ben and Pam making nutrient solution.
Patrick & Ben preparing for absorbance reading.
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Experimental Runs

Compare the growth of two strains of algae X1 and X2 in
- nutrient solution (X2) vs
- nutrient solution + 0.1 M salt (X1S and X2S)
Results: Experiment 1

Algae Concentration

X2 nutrient
X1S & X2S:
nutrient + 0.1 M salt

Days

Algae Conc.
Results: Experiment 1

Oil content

Spectrofluorometer Readings

X1S & X2S: nutrient + 0.1 M salt

X2 nutrient

Days
Results: Experiment 1

Oil capacity

- X1S & X2S: nutrient + 0.1 M salt
- X2: nutrient
Conclusions

Salt had a very positive effect on the oil capacity of both algae strains.
Experimental Runs

Study the effect of ocean water on algae growth. We compared:
-nutrient solution + 0.1 M salt
-A mixture of 50% ocean water + 50% (nutrient solution + 0.1 M salt)
Results: Experiment 2
Absorbances

Date of Readings

Days

Algae Conc.
Results: Experiment 2

Oil content

Days

Oil Content

- X2 50%S+ 50%Sea
- X2 S
- X1 S
- X1 50%S +50%Sea

Days

Results: Experiment 2

Oil Capacity

Days

- X = Oil Capacity

X2 50%S+50%Sea

X2S

X1S

X1 50%S+50%Sea

3/13/2008

3/18/2008

3/23/2008

3/28/2008

4/2/2008

4/7/2008
The oil capacity of Algae X1 was higher than X2 in both cases:
- a mixture of 50% nutrient+ salt and 50% ocean water
- nutrient+ salt
Next Steps

• Cultivate the best algae strain in 80 L photobioreactor
• Determine how much useful biodiesel can be recovered from the algae
Recap

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