

Ouachita Baptist University

## Scholarly Commons @ Ouachita

---

Scholars Day Conference

Scholars Day 2023

---

Apr 26th, 1:50 PM - 2:05 PM

### The Effects of Light Intensity and Cell Structure on the Cultivation of *Arthrospira platensis*

Taylor Barnhart

*Ouachita Baptist University*

Follow this and additional works at: [https://scholarlycommons.obu.edu/scholars\\_day\\_conference](https://scholarlycommons.obu.edu/scholars_day_conference)



Part of the [Algae Commons](#)

---

Barnhart, Taylor, "The Effects of Light Intensity and Cell Structure on the Cultivation of *Arthrospira platensis*" (2023). *Scholars Day Conference*. 2.

[https://scholarlycommons.obu.edu/scholars\\_day\\_conference/2023/honors\\_theses\\_d/2](https://scholarlycommons.obu.edu/scholars_day_conference/2023/honors_theses_d/2)

This Thesis is brought to you for free and open access by the Carl Goodson Honors Program at Scholarly Commons @ Ouachita. It has been accepted for inclusion in Scholars Day Conference by an authorized administrator of Scholarly Commons @ Ouachita. For more information, please contact [mortensona@obu.edu](mailto:mortensona@obu.edu).

THE EFFECTS OF LIGHT INTENSITY AND  
CELL STRUCTURE ON THE CULTIVATION  
OF *ARTHROSPIRA PLATENSIS*

Taylor Barnhart

# PURPOSE



## WHY SPIRULINA?

- Spirulina is a superfood
- 50-70% protein content
- Carbon dioxide → oxygen
- Algae > livestock

# CELL STRUCTURE

COILED



STRAIGHT



## PAST RESEARCH

Studying the difference of light intensities on cultivation

## OUR GOAL

Studying the difference of *cell structure* in different light intensities on oxygen production and cultivation

# EXPERIMENTS

## MATERIALS

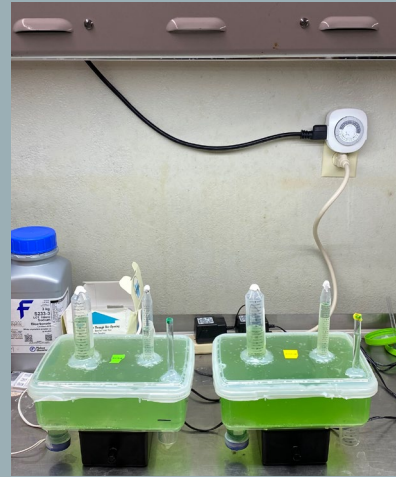


- 6 oxygen-monitoring containers:
  - 50 mL & 15 mL collection tubes & a clear plastic straw
- Two differently structured spirulina cultures:
  - The Mix original culture contained coiled and straight spirulina at a roughly 50/50 ratio. The Coiled original culture consisted purely of coiled spirulina.
- Zarrouk nutrient media
- 3 different light intensities:
  - $51 \mu\text{mol}/\text{m}^2/\text{s}$  ;  $25 \mu\text{mol}/\text{m}^2/\text{s}$  ;  $12 \mu\text{mol}/\text{m}^2/\text{s}$

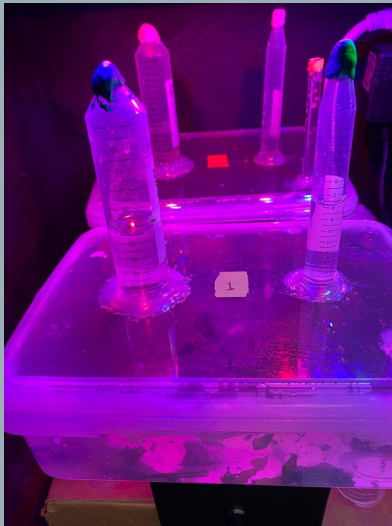


# METHODS

$51\mu\text{mol}/\text{m}^2/\text{s}$



$25\mu\text{mol}/\text{m}^2/\text{s}$



$12\mu\text{mol}/\text{m}^2/\text{s}$

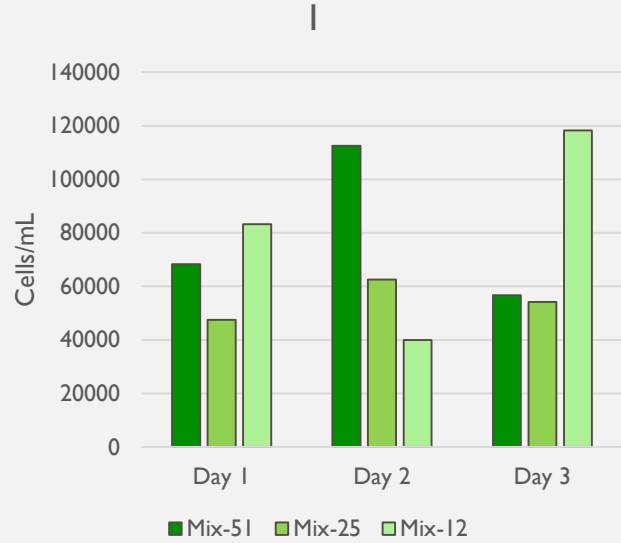


- Original cultures were maintained at a pH of 10 at  $30^{\circ}\text{C}$  and given 50 mL of nutrient media daily.
- 6 experiment containers: 3 of each culture type.
- Given 3 mL of nutrient media daily and placed under the different light intensities.
- Data was collected at the 24, 48, & 72 hour marks

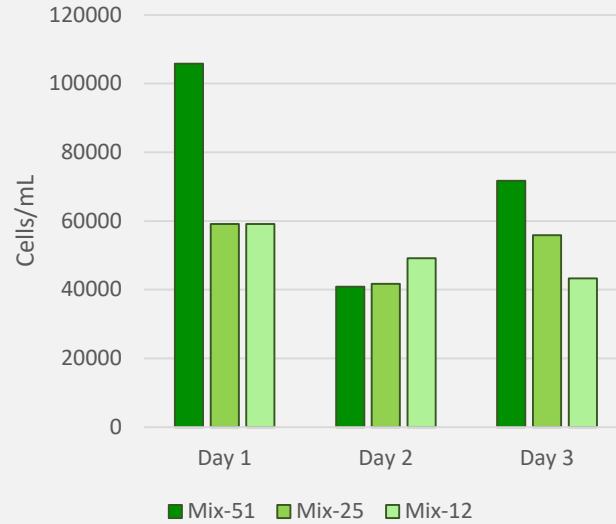
# RESULTS

# Cell Concentration

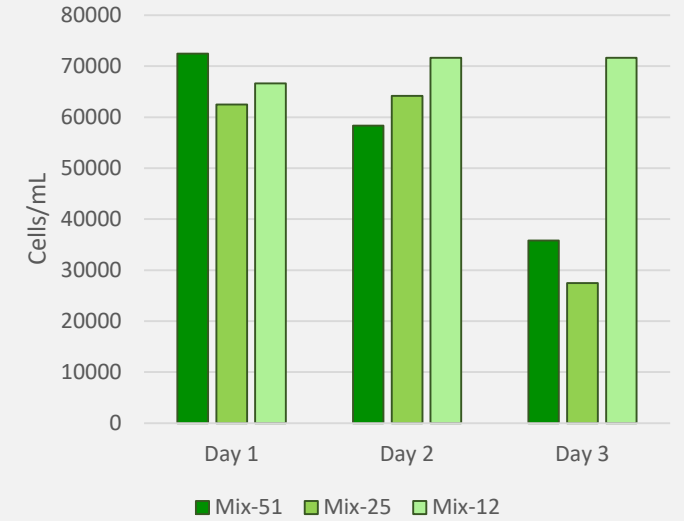
Cell Concentration of Mixed Exp. 1



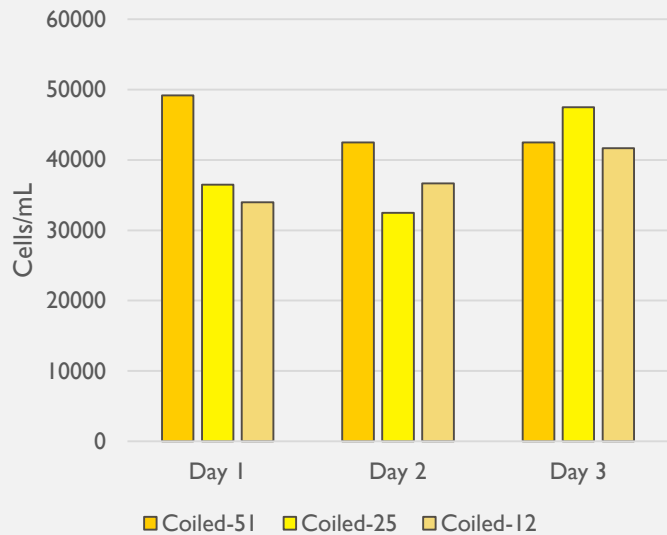
Cell Concentration of Mixed Exp. 2



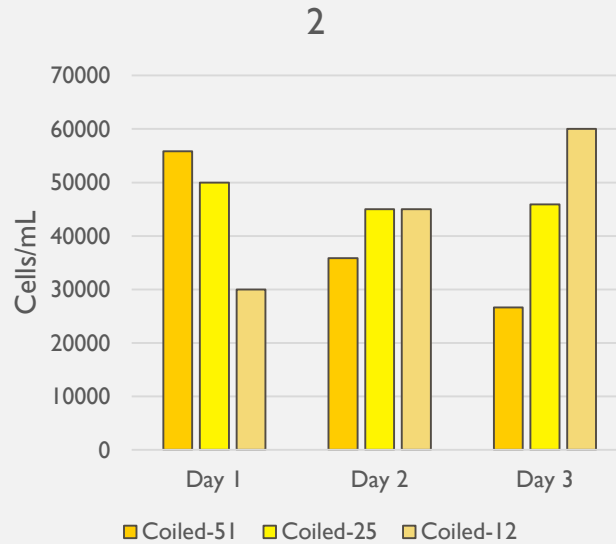
Cell Concentration of Mixed Exp. 3



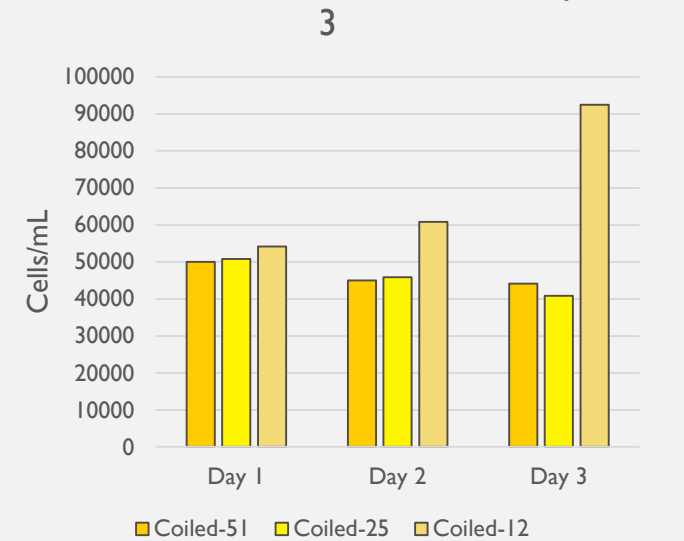
Cell Concentration of Coiled Exp. 1



Cell Concentration of Coiled Exp. 2

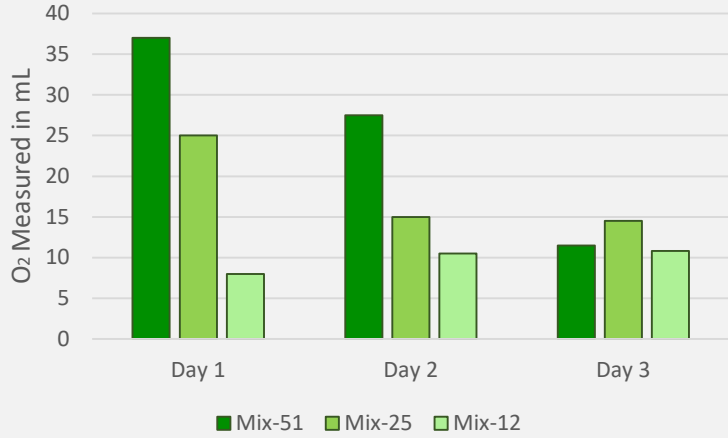


Cell Concentration of Coiled Exp. 3

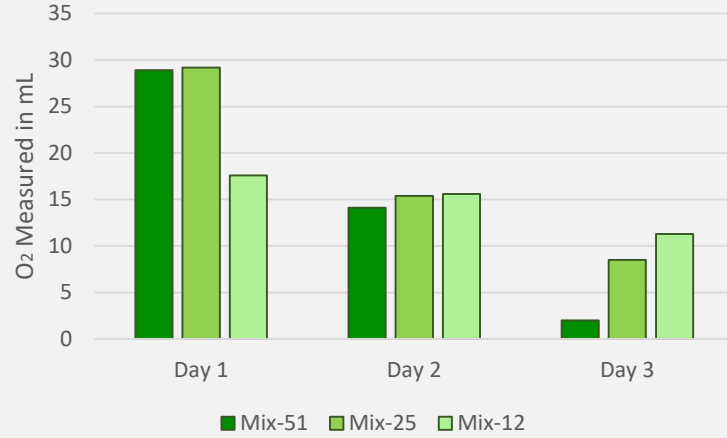


# Oxygen Production

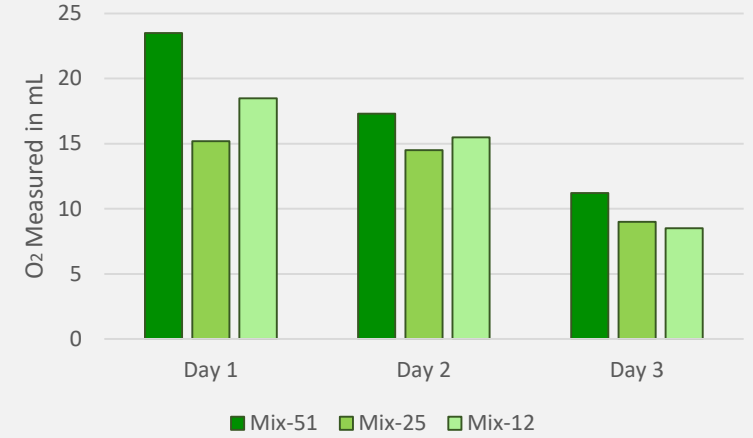
O<sub>2</sub> Production of Mixed Exp. 1



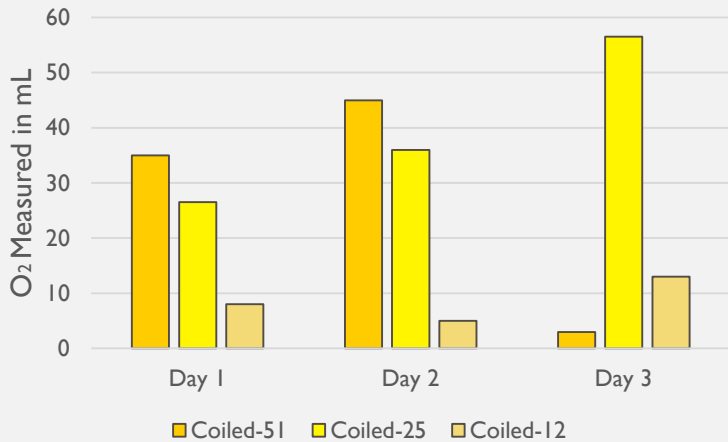
O<sub>2</sub> Production of Mixed Exp. 2



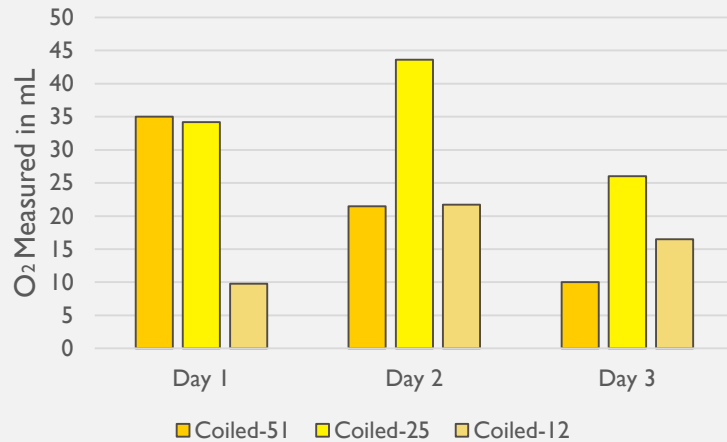
O<sub>2</sub> Production in Mixed Exp. 3



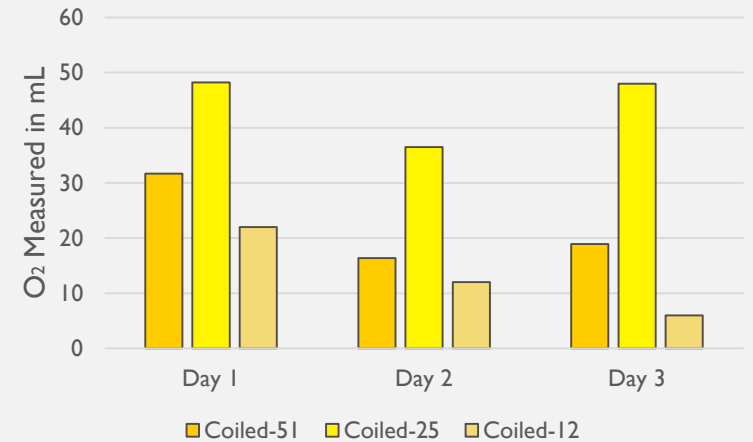
O<sub>2</sub> Production of Coiled Exp. 1



O<sub>2</sub> Production of Coiled Exp. 2



O<sub>2</sub> Production of Coiled Exp. 3



Oxygen Production

÷

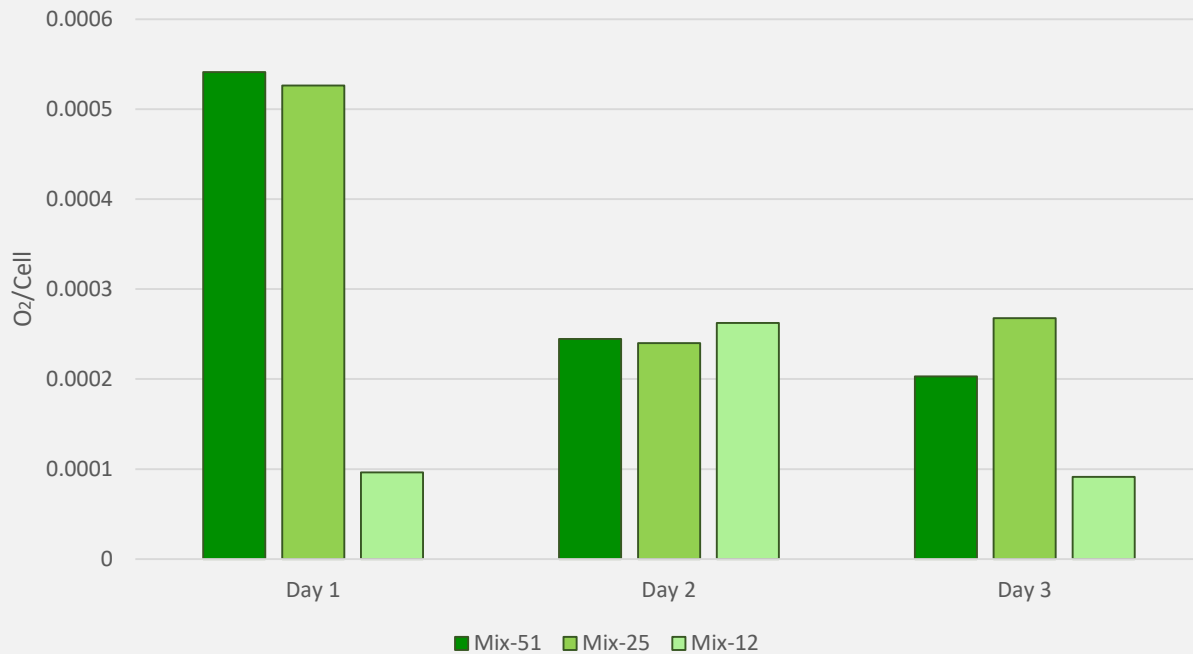
Cell Concentration

=

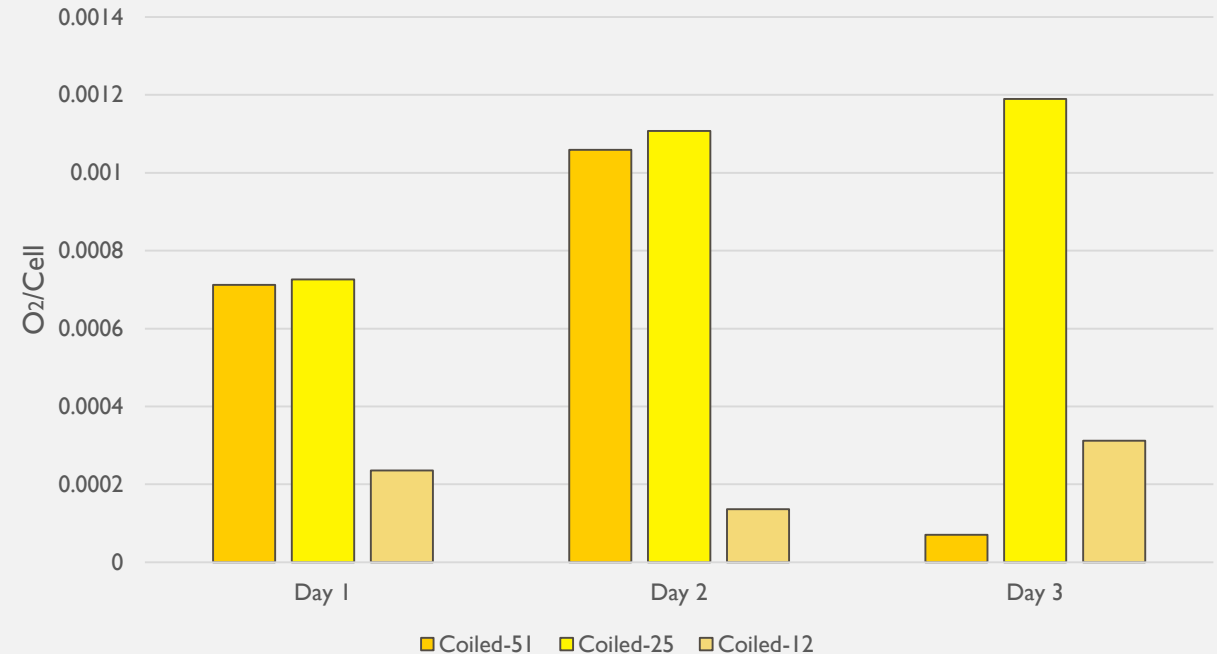
Oxygen Produced per Cell

# Exp 1 – Oxygen Produced Per Cell

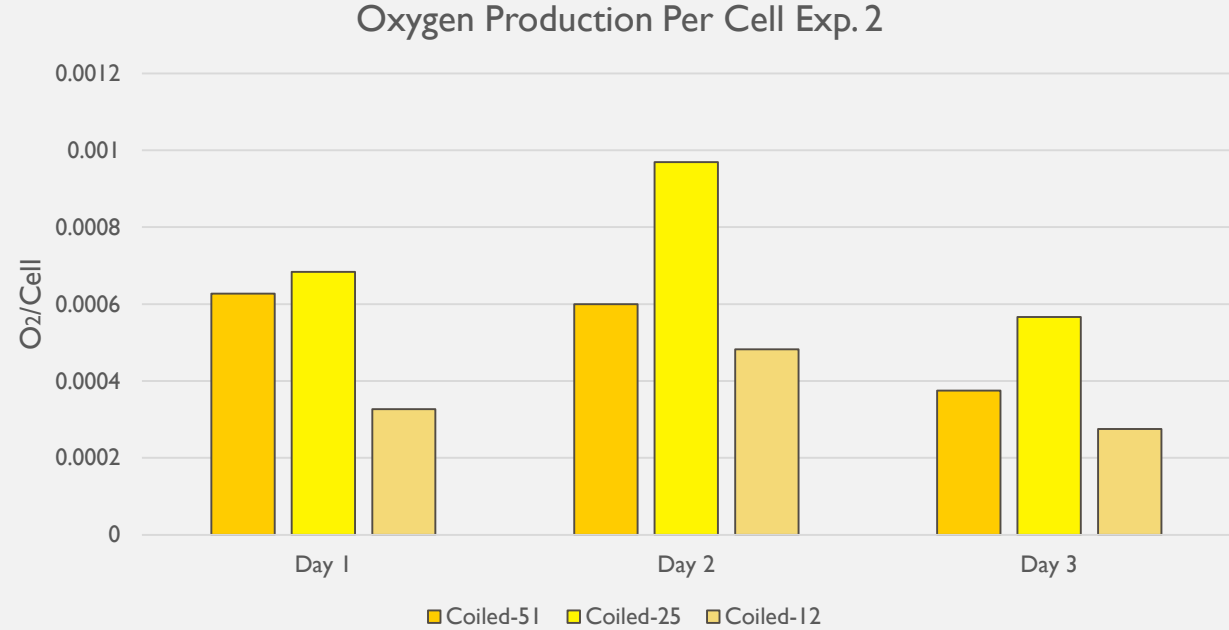
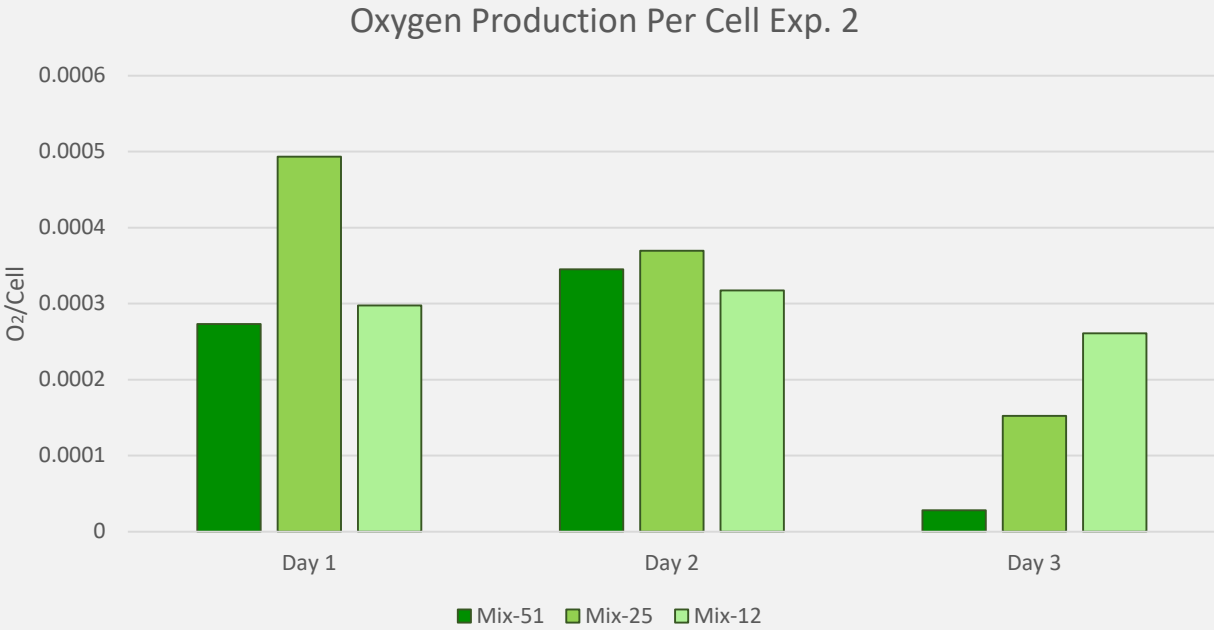
Oxygen Production Per Cell Exp. 1



Oxygen Production Per Cell Exp. 1

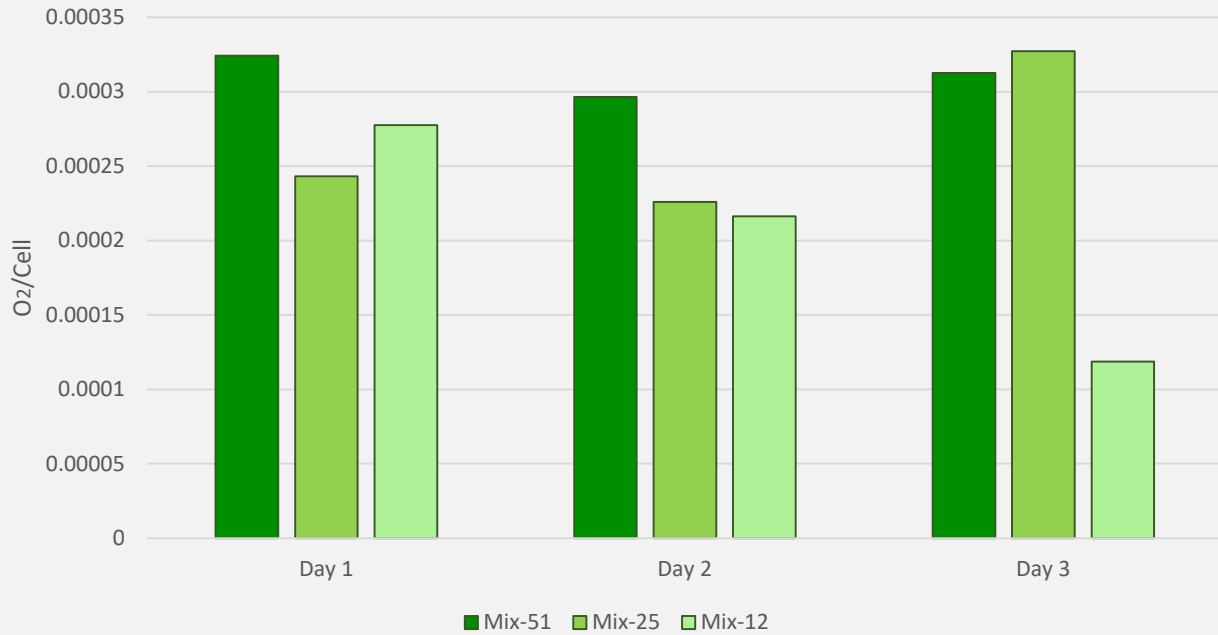


# Exp 2 – Oxygen Produced Per Cell

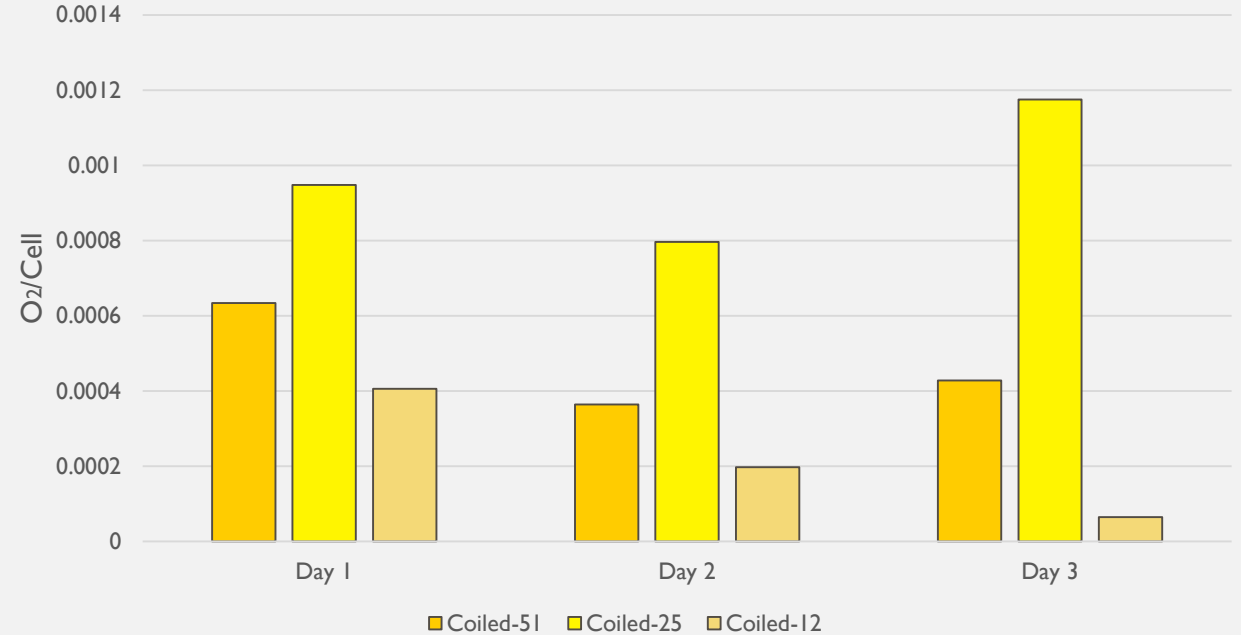


# Exp 3 – Oxygen Produced Per Cell

Oxygen Production Per Cell Exp. 3



Oxygen Production Per Cell Exp. 3





## CONCLUSIONS

- There is a difference.
- But why?
  - Protein content difference
  - Structure difference

## NEXT STEPS

- Red light → a more cost-effective alternative
- Longer experimental duration
- More testing on the different cell structures

# Acknowledgements

J. D. Patterson School of Natural  
Sciences

Ouachita Baptist University

NASA/ASGC & INBRE

Dr. Jim Taylor

Dr. Tim Knight

Dr. Scott Duvall

QUESTIONS?