SYNOPSIS FOR NATIONAL SCIENCE FAIR

Project Title: GREEN OXYGEN FACTORY-OXYGEN PRODUCTION USING ALGAE

(A Natural Air Purifier)

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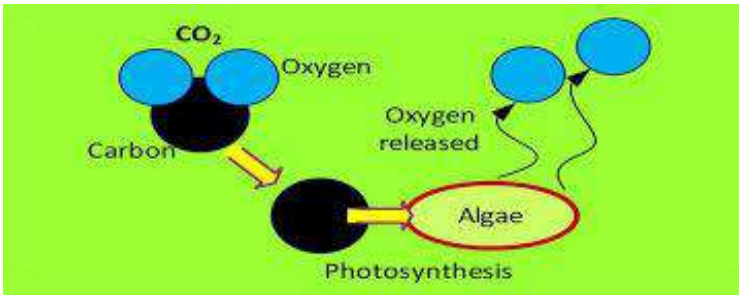
Introduction:

Oxygen is one of the most Essential elements for the life on Earth. While Trees and Forests are often credited as the "Lungs of the Planet", Scientific Studies reveal that nearly 70% of the Earth's oxygen is produced by Algae in oceans, lakes, and Ponds. Algae are simple plant like organisms that perform photosynthesis. They absorb carbon dioxide and release oxygen, while also producing energy-rich organics compounds. With increasing air pollution, deforestation, and global warming, there is an urgent need for sustainable and natural solutions to improve air quality and maintain Ecological balance. This Project demonstrates how Algae can acts as mini oxygen generator and how they can be applied in real world situations.



Selection of Problem and Background Information:

Air Pollution and declining air quality are major global concern. According to studies, poor air quality contributes to respiratory issues, stress and reduced productivity. While mechanical purifiers exist, they require electricity and produce waste filters. Algae, on the other hand, acts as natural Biofilter by consuming CO2 and pollutant while producing oxygen. Harnessing this biological property can provides a sustainable solution for homes, schools, and urban spaces.

Background Information

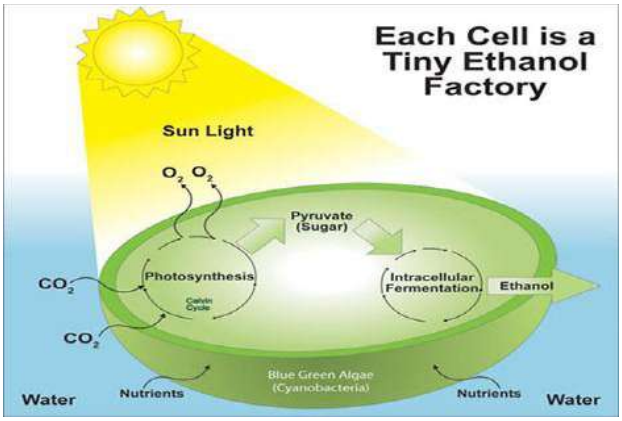
- Photosynthesis
- Importance of Oxygen
- Algae role are efficient oxygen producers in the Aquatic Ecosystem
- Factors Influencing Oxygen Production (Eg. Nitrogen, phosphorus)

Research Problem

- Optimizing Light Intensity: Finding the ideal light intensity for maximum oxygen production.
- Nutrient Limitation: Ensuring adequate nutrient supply for Algae Growth and oxygen
- Contamination Control: Preventing contamination by other microorganisms that can compete with Algae or reduce oxygen production.
- Scalability: Scaling up algae cultivation system for Large-scale oxygen production
- Stability and consistency: Maintaining stable and consistent oxygen over time.

Can Algae based systems significantly improve air quality by reducing CO2 and increasing oxygen concentration indoor?

- **Question:** How effectively can algae purify air compared to conventional air purifiers?
- **Need:** This problem need to be solved to create eco- friendly, cost effective, and sustainable air purifiers system.



Control Group :

Algae sample without any treatment or manipulation(eg. Standar of light intensity, nutrients levels)

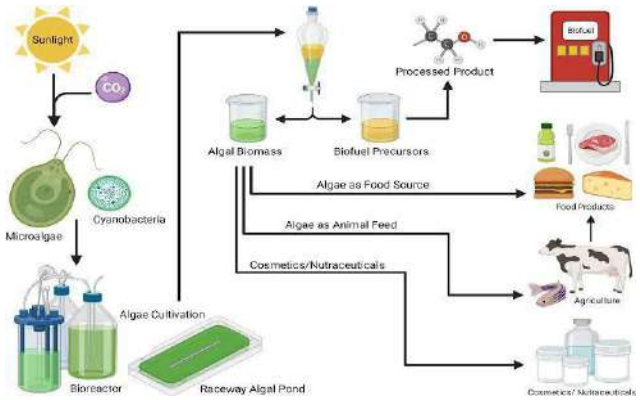
Blank sample (No algae,only water or medium)

Benefits:

Establish a reference point of oxygen production

Helps to identify the impact of variables on oxygen production

Enhances the validity of the result



Hypothesis

If algae are grown in controlled containers with sufficient light and nutrients, then they will absorb CO2 and release oxygen, thereby improving air quality and acting as a natural purifier. Algae are microscopic plants without a plant's root system. Leaves, stems, leaves and complex reproductive structure. It is estimated that there are more 1 million species of algae that are all capable of producing oxygen. The most impressive algae species is Prochlorococcus. Despite is Prochlorococcus being the smallest photosynthetic organism on Earth, it produces the most oxygen in the ocean.

- Increasing light intensity will increase oxygen production in Algae
- Algae grown in nutrient rich media will produce more oxygen than those grown in nutrient
- Different species of algae will have varying rate of production.

Procedure:

Materials Needed: Transparent container, freshwater algae culture (Eg. Cholerella,Spirulina),LED light sources, Dissolved Oxygen metre,CO2 sensor, pH strips, water nutrients, Thermometer, stopwatch, lab notebook.

Experiment Setup:

- Prepare three transparent containers with equal volume of water and nutrients.
- Introduce different Algae concentration(Low, Medium, High)
- Keep one container without Algae
- Place all containers under equal light under Equal light intensity for 7-14 days
- Record oxygen and CO2 levels daily using sensors.
- Compare results of algae container with control

Proposed Data tables (Sample data)

Oxygen Level (ppm) from different Algae					
Algae concentration(cells/mL)	Day 1	Day 2	Day 3	Day 4	Day 5

CO2 Concentration(ppm)in different Algae					
Algae type	Day1	Day 2	Day 3	Day 4	Day 5

Risk and Safety

- Algae sample should be handled hygienically to avoid contamination
- Avoid overgrowth that may cause foul odor
- Use gloves when handling nutrients solution
- Ensure proper disposal of algae after the experiment
- Environment Factors such as temperature, light, pH, and nutrient availability
- Emergency procedures should be place in case of accident or spills

Data Analysis

- Collected data will be analyzed by plotting by oxygen and CO2 levels over time
- Graphs will compare different concentration of algae with the control
- The effectiveness of algae as a natural air purifier will be determined based on the rate of oxygen production and CO2 reduction

Bibliography

Journal Articles:

- **Richmond,A. (2004). Handbook of Microalgal Culture: Biotechnology and Applied Phycology. Blackwell Publishing.**
- **Priyadarshani,I., & Rath,B.(2012). Commerical and industrial application of Microalgae- A review. Journal of Algal Biomass Utilization**

Books:

- **Algae: An Introduction to Phycology: VanDenhoek, Christiaan, et al.(New York: Cambridge University Press,1995)- Acomprehensive survery of algae, including their phtotsysthetic capabilities and oxygen production.**
- **Biology of Plant: Raven, Peter H., Ray F. Evert, and Susan E. Eichhorn (6th ed. New York: W. H. Freeman/Worth,1999) – Covers Key Algae Group, including their role in oxygen production and carbondioxide**
- **Common Freshwater Algae of the United States: Dillard,Gary E.(Berlin:J. Cramer,1999)- Provides an overview of fresh water algae including their reproductive strategies and ecological importance.**

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