



Carbon Crazy

Effectiveness of Household Materials in Reducing Carbon Dioxide



Varun Chandar & Akarsh Maurya



Introduction

Carbon dioxide is a common greenhouse gas essential for plant growth but is detrimental if there are excess amounts, due to its role in global warming and health risks like asphyxiation. Carbon capture and storage (CCS) systems improve air quality and help climate change but are often impractical for household use. This project aims to develop cost-effective household solutions to reduce CO₂ emissions and improve understanding of carbon capture materials and chemical reactions involved within CO₂ reduction.

Testable Question and Purpose

Testable Question: How does different household carbon capture materials affect CO₂ reduction indoors?

Purpose: The purpose is to explore solutions to reduce CO₂, which contributes to global warming, health risks, and environmental changes. The experiment seeks to identify which household material best reduces CO₂ to improve living conditions and combat climate change.

Variables

- **Independent Variable:** Type of household carbon capture material - Dracaena, Limewater solution, Activated charcoal, and Golden Pothos
- **Dependent Variable:** Reduction in CO₂ levels measured by ppm
- **Side Variables** (not the main source of data): Temperature (°C) and humidity (%)

Constants & Control

- **Constants:** Location, measuring units, experiment duration, and CO₂ sensor type
- **Control Group:** Airtight container with no carbon capture material

Hypothesis

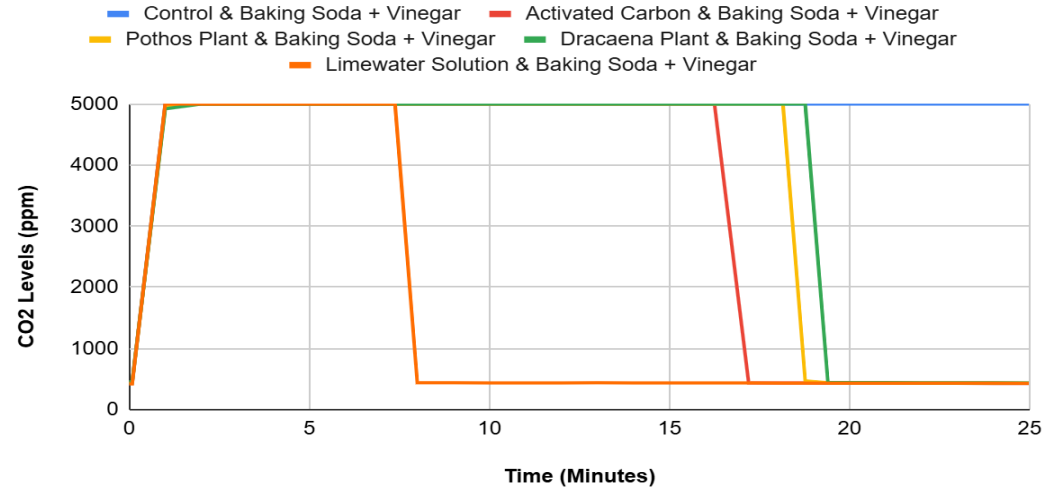
The hypothesis predicted Dracaena would remove the most CO₂, compared to the other materials, due to its continuous biological method of taking in carbon dioxide through photosynthesis. The supporting thesis states that the biological ability of Dracaena, absorbing CO₂ and converting it into oxygen and organic matter, will be better than other materials that rely on chemical or physical processes. The Dracaena is additionally predicted to outperform the Golden Pothos plant due to changes in leaf structure and growth rate.

Experimental Method

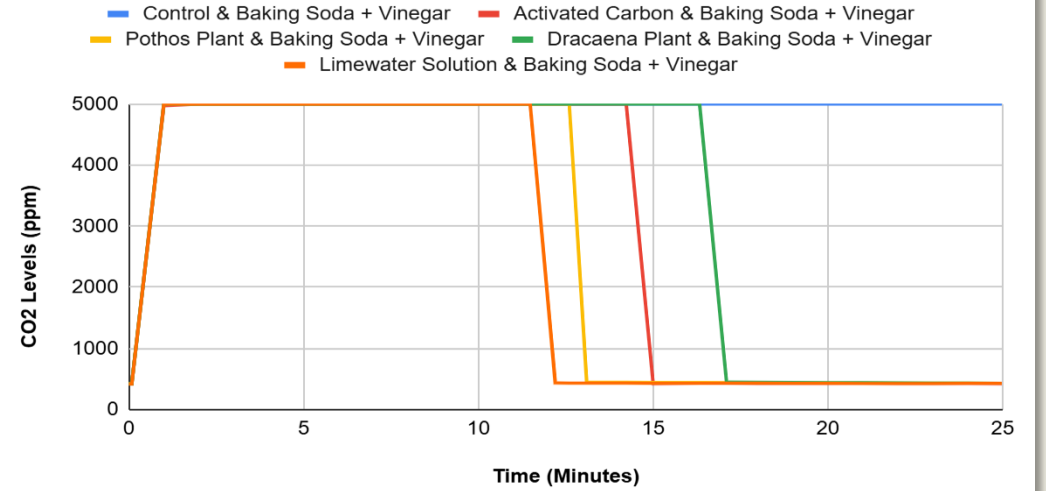
CO₂ was produced inside an airtight container by mixing baking soda and vinegar. For each trial, only one carbon-capture material was placed in the container at a time. The concentration of CO₂, along with temperature and humidity, was measured using a digital CO₂ sensor at five-minute intervals. Measurements continued until CO₂ levels returned to their original starting values. The results for each material were compared based on the time required to reduce CO₂ concentrations.

Data Graphs

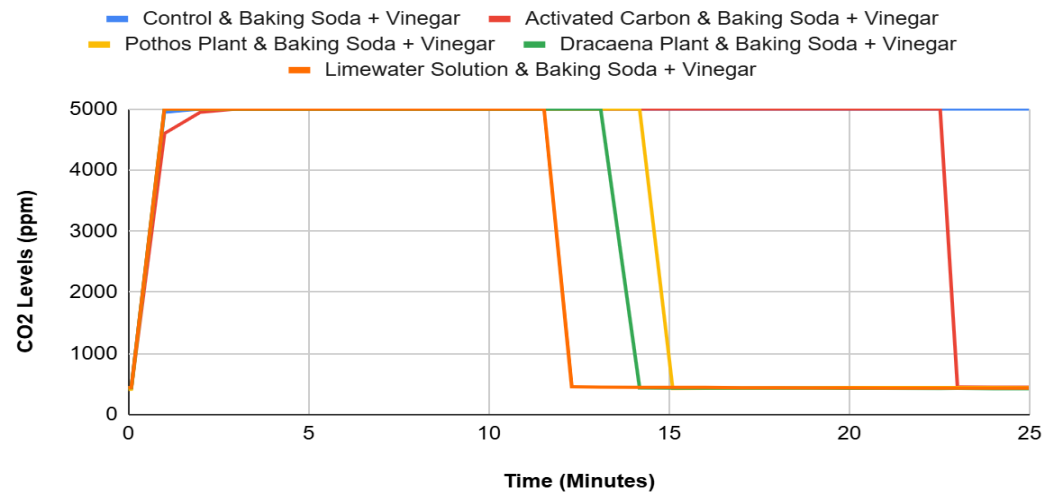
Test 1 - CO2 PPM vs. Time



Test 2 - CO2 PPM vs. Time



Test 3 - CO2 PPM vs. Time



Results

These findings demonstrated that the limewater solution was the fastest at reducing CO₂, lowering levels about 57.6% sooner than the control (mean time: 10:02 min). Pothos plants were able to lower CO₂ about 40.5% faster (mean time: 15:02 min), while Dracaena plants reduced about 35.7% faster (mean time: 16:06 min). Activated carbon reduced CO₂ levels by about 32% more quickly than the control group (mean time: 17:40 min). The control group itself maintained high CO₂ concentrations until 25 minutes into the experiment (mean time 25:13 min).

Conclusion/Discussion

Limewater proved to be the most effective material because it directly reacts with carbon dioxide, showing that chemical methods can reduce CO₂ faster than biological methods. However, the Golden Pothos plant was the second fastest material, indicating that it can also be useful for carbon dioxide reduction. Additionally, Golden Pothos is more commonly found as a household item than limewater. Some possible improvements in this project include further testing and a longer duration of the experiment, ensuring there are no air leaks in the jar, and better cleaning of excess material from the previous trial.