

# Science fair Report

*by* Elizabeth Armstrong

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## Plants vs CO2

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### **Abstract**

The main idea of my project was to see how carbon dioxide affects plants. My research suggested that plants with more carbon dioxide should grow better. To test my idea I used radishes and put one in an environment with more CO<sub>2</sub> and the other in an environment with normal amounts of carbon dioxide. The results did not turn out the way they were expected. I thought that the plants with more CO<sub>2</sub> would do better, but the plants with less actually did better. I also noticed that almost all of the plants sprouted in B tray but only three sprouted in the A tray. For future research I would like to look into why these plants didn't sprout. I would also like to look at more results of more CO<sub>2</sub> than just height.

## **Introduction**

### ***Statement of Purpose***

The amount of carbon dioxide in the atmosphere has been slowly rising since the Industrial Revolution. I wanted to know how it would affect the plants, not just the environment.

### ***Investigative Question***

How are radishes height affected by having more carbon dioxide in the atmosphere than normal?

### ***Background Research***

I have decided to research carbon dioxide and its affect on things around it including global warming because I have heard a lot about it and I have always wondered what was even going on. I wondered how global warming would affect us in the future. How this will affects plant life is another question I have about carbon dioxide. Global Warming is increasing temperature on the earth because of increasing numbers of greenhouse gasses like carbon dioxide in the atmosphere. This paper will cover what carbon dioxide is, how it connects to global warming, and how it affects plants.

Carbon Dioxide is becoming an increasingly popular topic of conversation. According to Universal Industrial Gases Inc., carbon dioxide, also known as CO<sub>2</sub>, is formed by burning something, decomposition, exhaled air (which is about 4% carbon dioxide), lime kilns where they burn limestone to make cement, and many other ways.

The properties carbon dioxide has includes being a bit toxic, having no smell or color, and tasting acidic and pungent. The uses for CO2 is fire extinguishing, making soft drinks carbonated, freezing food, making meat cold before it gets ground, and treating alkaline water, which is a water ionizer. The reason carbon dioxide can be used as a fire extinguisher is because "CO2 will not burn or support combustion"(Universal Industrial Gases Inc.), air with 10% or more CO2 will put out any flame. Carbon dioxide is referred to as a greenhouse gas because it lets all light and heat energy in but not all energy out, like a greenhouse. CO2 is also 1.5 times as heavy as normal oxygen, making it more concentrated at lower heights. With all of these things connected to carbon dioxide, how does this affect the environment?

Carbon dioxide is a big factor in an environmental crisis called global warming. CO2 causes global warming by absorbing heat energy from underneath Earth's crust, when the molecule absorbs this, it becomes unstable and to become stable again, it has to release the energy back into the atmosphere(How Does Carbon Dioxide Cause Global Warming). Recently the amount of carbon dioxide in the air has been higher than usual. Normally there is only about .038% CO2 in the air, but recently that number has has been rising by about .0002% per year for the last 60 years(Universal Industrial Gases). Lansing State Journal states "If this continues some meteorologists expect that the average temperature of the Earth will increase by about 2.5 degrees Celsius...it could be enough to cause glaciers to melt, which would cause coastal flooding". There are many other gasses out there that cause global warming. Scientists use GWP (global

warming potential) to measure how much energy the gas absorbs over 100 years, it uses carbon dioxide as a baseline, that means CO<sub>2</sub>'s GWP is 1. Even though carbon dioxide has a GWP of only 1, it stays in the atmosphere for thousands of years.

Methane (CH<sub>4</sub>) has a GWP of more than 20, which means it causes 20 times the amount of global warming CO<sub>2</sub> does, but it only stays in the atmosphere for about 10 years. Nitrous Oxide (N<sub>2</sub>O) has a GWP of 300 and stays in the atmosphere for 100 years. Even though these gases seem much worse than CO<sub>2</sub>, these gases aren't released into the atmosphere as much, making them not much of a threat (Carbon Dioxide Emissions). With global warming happening, how is more CO<sub>2</sub> in the air affecting plants?

With more CO<sub>2</sub> in the atmosphere, the plants have been affected too. Since the Industrial Revolution, crop has been doing significantly well, scientists believe the reason for this is more carbon dioxide being released into the atmosphere. The reason carbon dioxide helps crop grow better is it lets plants photosynthesize faster and grow more. With more CO<sub>2</sub> accessible by the plants, they don't have to open up pores as much to let in CO<sub>2</sub> and don't let out as much water vapor, using less water and making it easier to grow. Even though CO<sub>2</sub> helps crops grow better, temperature changes and weird rain patterns, which are side effects of global warming, harm plant growth. Also with less nutrients, bugs will eat the carbon dioxide filled leaves to acquire their needed nutrients. These are some of the things carbon dioxide is and causes (Global Climate Change).

This paper was about what carbon dioxide is, how it connects to global warming, and how it affects plant life. I learned how greenhouse gases work and what other threatening gases are out there. I also learned about how plants photosynthesize and how more carbon dioxide helps it go faster. Lastly, I learned about what properties CO<sub>2</sub> holds. This research will help me on my science fair by aiding in me figuring out how to setup my project, come up with a hypothesis, and just get some general background on what is happening.



## Procedure

### *Procedure Summary*

The basic method I used for this project was to put CO<sub>2</sub> in the atmosphere of one tray once a day. Originally I was going to put a bowl over the plants for an hour a day and put dry ice under the bowl, but then I realized that it would be hard to keep a supply of dry ice.

### **Materials**

1. 16 radish seeds from OSH
2. 2 ( ) by ( ) plastic trays
3. 2 8 cup planters (the compostable kind)
4. Vinegar
5. Baking soda
6. Soil from OSH
7. Camera
8. Water
9. Spray Bottle
10. Saran wrap
11. ¼ measuring cup
12. 1 tablespoon
13. 10 inch wooden shish kebab skewers
14. Glass Bread pan

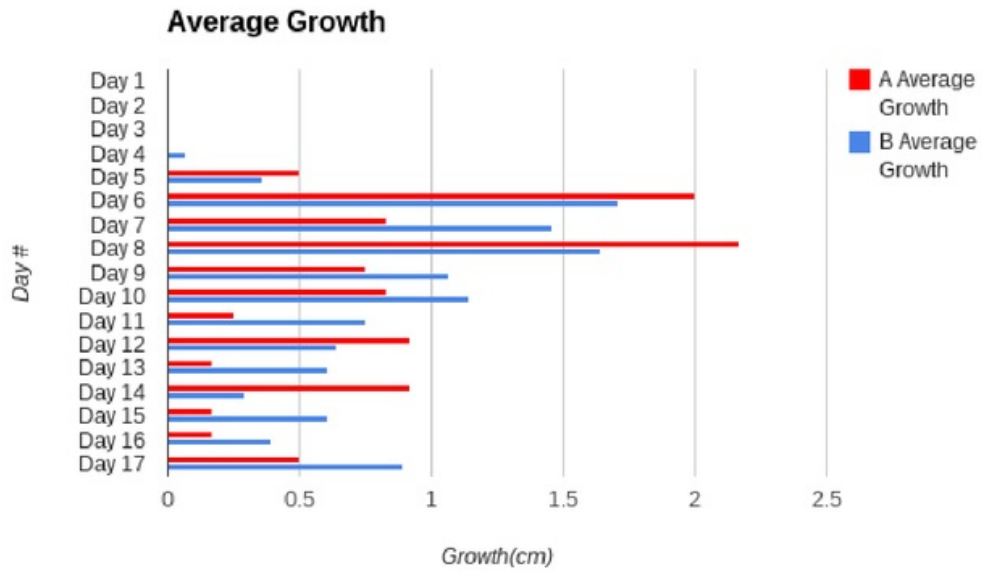
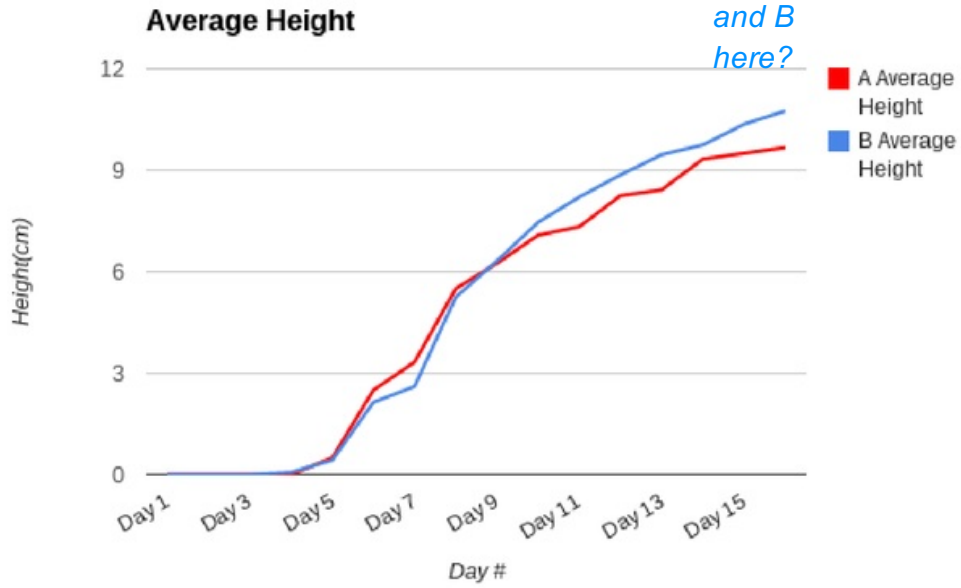
### **Method**

1. Collect materials
2. Put ½ cup of the soil into each cup of the 2 planters
3. Put the planters into the plastic trays
4. Put ¼ cup of water in each cup of the planters
5. Plant 3 seeds 1/2 inch deep in each cup
6. Tape the skewers to the sides of the plastic tray
7. Wrap the saran wrap around the trays
8. Label one tray " A" and label the other "B"
9. Tape the bottom of tray A to keep all of the CO<sub>2</sub> in.

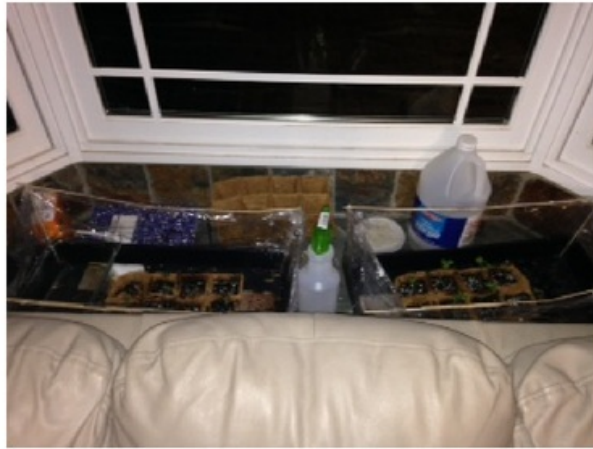
10. Put the bowls in a sunny area next to each other
11. Water the plants with 5 squirts per cup, twice a day.
12. On the 4th day, start putting carbon dioxide into tray A by taking a bowl and putting 1 tablespoon of baking soda and 12 tablespoons of vinegar
13. Make CO<sub>2</sub> that way every day in the morning
14. Measure plants with centimeters pulled to full extent every day
15. Record all data in your notebook/computer

## Data & Results

*What's the  
difference  
between A  
and B  
here?*



	A Average Growth (cm)	B Average Growth (cm)	A Average Height (cm)	B Average Height (cm)
Day 4	0	0.07	0	0.07
Day 5	0.5	0.36	0.5	0.43
Day 6	2	1.71	2.5	2.14
Day 7	0.83	1.46	3.33	2.61
Day 8	2.17	1.64	5.5	5.25
Day 9	0.75	1.07	6.25	6.32
Day 10	0.83	1.14	7.08	7.46
Day 11	0.25	0.75	7.33	8.21
Day 12	0.92	0.64	8.25	8.86
Day 13	0.17	0.61	8.42	9.46
Day 14	0.92	0.29	9.33	9.75
Day 15	0.17	0.61	9.5	10.36
Day 16	0.17	0.39	9.67	10.75
Day 17	0.5	0.89	10.17	11.64



*The setup of the plants*



*Tray B on day 17*



*Tray A on day 17*

	Tray A	Tray B	Total possible
# of plants	3	7	8

### **Discussion / Conclusion**

For my science project, I tested whether radishes survive better in environments with more Carbon Dioxide or not. I had sixteen compostable planters that I planted 3 seeds in each and put eight in a normal environment and the other eight in the same environment except with more carbon dioxide in the atmosphere. I put more CO<sub>2</sub> in the atmosphere by combining vinegar and baking soda in a bread pan inside the environment. I also measured and watered each plant everyday.

My hypothesis was the the tray with CO<sub>2</sub> added would have taller radishes. I thought this because in my research, it said that carbon dioxide was what helped plants photosynthesize, so is they had more CO<sub>2</sub>, theoretically they could photosynthesize faster and grow faster.

My results showed that the plants with more CO<sub>2</sub> in the atmosphere didn't sprout as much. The graphs show that the tray that is overall tallest varied, at first the one with CO<sub>2</sub> was taller, but then the ones in the normal atmosphere had taller plants at the end of the experiment. The one with the most amount of growth also varied day to day. My hypothesis was probably wrong because the carbon dioxide didn't affect the plants as much as I expected it to. Another reason my hypothesis was wrong was because I didn't factor in all of the negative sides to carbon dioxide.

There are a couple things that could have affected the data. The first thing is that the plants might have had different exposures to sun because of the setup, other plants in the way or the angle of the sun. Another thing that could have affected the results is where the bread pan was. I could only put it on one side if the tray and so the plants

closer to the pan got more exposure to the CO2.

Something I can improve in my research is I could have looked further into plants and CO2. I could have tried harder to understand how greenhouse gases work. I could have also looked more into the photosynthesis process. I have also improved by looking into the germination process.

If were to do this experiment again, there would be a few things I would change. The first thing I would change is I would spread the carbon dioxide more evenly by having a pan on either side of the plants. I would also have artificial sunlight so I could keep my plants indoor so weather patterns would not affect it. I would also put a bread pan into the other tray so if that affected the amount of sunlight the plants got, it would happen to both samples.

Overall, this experiment was way more successful than my previous one where only 4 of the 16 sprouted. My results were that there doesn't really seem to be a correlation between how tall the plants get and the amount of carbon dioxide in the enviornment. These results were not the ones I expected but they will be useful in the future.

### **Acknowledgements**

I would like to acknowledge my mom and dad for helping me work on my science fair. My dad helped me by helping me come up with my idea for the design and project, he also went with me when I bought all of the materials I would need. My mom helped me by watering the plants when I didn't have he time to. Overall, I would like to



thank my parents for making doing this project possible.

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# Science fair Report

## GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

19/24

**Instructor**

Good, some small improvements made, could have been a really cool project with a larger sample size, perhaps next year...

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**Text Comment.** What's the difference between A and B here?

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