

LOGBOOK

First Name: Avneet (Avy)

Last Name: Gill

Grade: 7

School: Stem Innovation Academy

Project Details:

Project: Is it better for a plant to flourish with or without human intervention?

Project Type: Experiment

Project Category: Life Sciences

Project Topic: Botany / Plant Science, Earth Science, Environmental Science, Life Sciences

Objective of Experiment:

The growth of a plant can be influenced by both natural environments and human-assisted environments. In a natural environment, a plant has access to sunlight, soil nutrients, and water, which are essential for its growth. However, conditions can be unpredictable and may not always be optimal. In a human-assisted environment, such as a greenhouse, conditions like light, temperature, and humidity can be controlled to optimize plant growth. However, it requires human intervention and resources. Therefore, whether a plant grows better in a natural or human-assisted environment can depend on the specific plant species and the conditions of the environment.

Brief Description of Project:

I will cultivate 2 different mustard plants. I will grow them under the same natural conditions. However, I will take care of one of them and let the other one grow on its own. This will help us understand the role of humans in the growth of plants.

Purpose of Experiment:

To determine whether a plant develops better with human assistance against in a natural environment.

Description of Experiment:

I'll be utilizing a mason jar that doubles as a miniature greenhouse, just like real scientists. It will keep the plant nice and warm, similar to a warm blanket. This plant will grow with the help of humans to provide nutrients. Another plant, on the other hand, is like an explorer in the outside world, growing without any special assistance. It's like a pleasant race between these plants as they grow. I'm curious who will win! Then I'll look under a microscope at the microscopic building pieces inside the plants known as cells. This helps me in determining which plant has the most healthy and nutritious cells. So,

this experiment allows me to understand about plants, how they grow, and which environment they prefer.

Hypothesis:

I believe that a plant will thrive better in its native environment. Thus, it proceeds to develop in a more comfortable and suitable environment where it can interact with various types of animals, insects, and plants. Even if it does not have a highly nutritious life, the plant will not be living in a restricted, forced, and human-based environment. I feel that living in an environment with a diversity of animals and plants to interact with, will always make a plant feel at ease.

Research Summary (Background Research :

In greenhouses, plants can live, grow, and receive protection while being given the warmth and light they need to flourish. They enable plants to grow more quickly and healthily by shielding them from pests, severe weather, and winds. Greenhouses are perfect for growing food or flowers because they allow gardeners to regulate the watering and temperature.

Because they supply the nutrients that plants need to grow large and robust, soil fertilizers are vital. Plants that receive the proper amount of fertilizer can develop more leaves, grow taller, and produce flowers or fruits that are more vibrant. Growing plants hydroponically—growing them in water or other media—is a productive method of supplying nutrients to the roots of the plants.

Variables:

Controlled variables- The Placing of the plants remained constant.

Manipulated/Independent Variables- Fertilizer added in one plant, and not added in the other.

Responding/ Dependent Variables- The fertilizer plant does not grow as well as the other one, while the non-fertilizer plant grows healthier than the fertilizer plant since it is not over fertilized.

Procedure:

1. Get Materials
 - o 2 Mason Jar
 - o Soil
 - o 1 Fertilizer stick
 - o 2 Waterproof Box
 - o Drill
2. Drill four holes in the lid of jar 1
3. Fill one of the water-proof boxes with cold tap water

4. Fill jar 1 with soil and plant a few seeds
5. Add ½ of the fertilizer stick in the water- proof box
6. Flip over jar1 and place it in the water, let it set
7. Repeat with the other jar. (Skipping step 5)

Observations:

Visual Observations:

1) Longer Roots

I can see that the plant with the fertilizer has longer roots and the other one has much shorter roots. The longer roots mean that the plant is stronger which shows that it is healthier.

2) Greener than the non-fertilized plant.

Green means that the plant with fertilizer has more chlorophyll. Chlorophyll is a hue of green found in bacteria and all green plants that is in charge of absorbing light and converting it into energy for photosynthesis. One magnesium element is contained in the ring of porphyrin within its molecule.

3) More Mold

The plant without fertilizer had chunks of mold growing in it so we can say that the plant without fertilizer didn't grow as well.

Observations (Microscope)- Fertilizer Jar

In a setting where people are present, a plant may absorb more nutrients than it requires, turning it dull and less healthy. It's similar to how overworking one's body can lead to a variety of problems later in life, including allergies, eating disorders, metabolic diseases, chronic diseases, and much more. I gave it more nutrients than it required, so it began to absorb a lot of them, which wasn't healthy for the plant. Ray Bradbury's quote, "Too much of anything isn't good for anyone," is relevant here. Humans have a tendency to provide plants with additional nutrients in the belief that this will help them grow better, but in reality, the plants do not grow to our expectations. This can make a plant live a unhealthy life.

Observations (Microscope)- Non- Fertilizer Jar:

The plant was not overfertilized since we didn't add the fertilizer, despite the fact that mold is visible developing on the soil's crust, which allowed the plant to live a much better life.

Sources of error:

I accidentally added hot water on Trail 1, which resulted in an excessively humid jar. As I waited for weeks, that caused the plant to die and stop growing. Eventually, I had to start my experiment again. Trail 2 turned out to be successful.

Analysis:

Based on the detailed analysis of the appearance of the leaves of both Plant A and Plant B, we observed distinct behaviors in both. Plant A is the fertilized one and Plant B is unfertilized.

Plant A develops visibly longer and stronger roots. This is because Plant A has higher access to nutrients and thus the roots develop better to absorb these nutrients.

However, while Plant B has lesser quality of roots than Plant A, it is seen that when looked at with the naked eye, the appearance of both plants seem alike.

When these plants are separately observed under a microscope, Plant A appears dull and a very light shade of green while Plant B appears bright green.

The green color of a plant indicates the presence of chlorophyll which is responsible for assisting in Photosynthesis and allowing plants to respire and produce energy in the form of sugars.

Thus, Plant B appears to have had a healthier growth than Plant A despite the excess nutrients that were given to Plant A which would hypothetically allow for a better growth.

Conclusion:

Despite Plant A being given more nutrients for a better growth than Plant B, Plant B seems to have grown to be healthier. This would be so because of the quantity of fertilizer that was provided to it.

Over-fertilization of a plant ends up harming it rather than achieving the desired results. It alters the soil and makes it unfavorable for helpful microorganisms to survive which affect the wellbeing of the plant. Moreover, overfertilization leads to the sudden growth of the plant as seen by the long roots developed, however the quality of the network of the roots remains insufficient and causes unsustainable plant growth spurts.

Moreover, overfertilization also has dangerous impacts on the environment by disturbing soil chemistry and poisoning water bodies when they run off with rain or irrigation since they are too excessive to be absorbed in the soil.

Application:

This science fair project aims to explore the impact of using excessive fertilizers on plant health. In this experiment, two identical plants will be used. Using fertilizer, one plant (Plant A) will acquire an abundance of nutrients, while Plant B won't receive any. To guarantee a fair comparison, both plants will be housed in the identical environmental circumstances. Because Plant A is overfertilized, we predict that it will take more nutrients than it needs, which will result in a great appearance and that it would be healthy. However, it is anticipated that Plant B, which is not fertilized, would continue to not be as robust and healthy but still a little healthy. This project will provide valuable insights into the effects of over-

fertilization on plants. It will help gardeners and farmers understand the importance of balanced fertilization for optimal plant health.

Contacts and References:

- Mom
- Dad
- Sister
- Brother
- Aunt

Citations go right into slide

Entry Dates:

October 3, 2023- Research

October 5, 2023- Research

October 8, 2023- Wrote down Research.

October 12, 2023- Wrote down research.

October 17, 2023- Research

October 24, 2023- Research

October 29, 2023- Wrote down research and made final checks in editing to research.

November 13, 2023- Started writing citations properly.

November 20, 2023- Continued writing citation in correct format

November 26, 2023- Finished up writing citations in correct format.

December 4, 2023- Brought materials to do project and wrote down hypothesis.

December 10, 2023- Set up project and wrote down objective.

December 14, 2023- Recorded observation of humidity in jar and noticed that plant wasn't growing.
(Wrote down in sources of error)

December 17, 2023- Brought new materials to do project.

December 20, 2023- Setting up project again (Same Hypothesis)

December 24, 2023- Wrote down visual observations.

January 3, 2024- Wrote down Procedure.

January 7, 2024- Wrote down Manipulated Variables.

January 11, 2024- Wrote down Controlled Variables

January 16, 2024- Wrote down Responding Variables

January 21, 2024- Did both microscopic observations

January 25, 2024- Fully finished up experiment part- Brainstormed about how experiment went and what to write in slideshow.

January 29, 2024- Copied logbook onto slideshow and put in pictures in slideshow, wrote down microscopic observations in slideshow and in logbook.

January 31-, 2024- Wrote down analysis, conclusion, acknowledgments, application.

February 4, 2024- Made sure there were o grammatical errors or mistakes in slideshow (Cleaned up slideshow)

February 7, 2024- Decorated trifold with information and completed CYSF experiment on CYSF platform.

February 9, 2024- Made video.

February 11, 2024- Started preparing for pitch (did every day until presentation day)

Citations:

- **The Editors of Encyclopaedia Britannica. (1998, July 20). Greenhouse | Definition, Types, & Uses. Encyclopedia Britannica. <https://www.britannica.com/topic/greenhouse>**
- **Ray Bradbury Quote: “Too much of anything isn’t good for anyone.” (n.d.). <https://quotefancy.com/quote/1842388/Ray-Bradbury-Too-much-of-anything-isn-t-good-for-anyone>**
- **Collins Canadian Dictionary, Robert Pontisso/Lorna Gilmour/Robert Groves/ Mary O’Neill, HarperCollins Publishers, No Date, No Author, <https://www.harpercollins.ca/9780008184629/collins-canadian-dictionary/>**
- **Weininger, J. (2024, January 5). Nutritional disease | Definition, Examples, & Facts. Encyclopedia Britannica. <https://www.britannica.com/science/nutritional-disease>**
- **Brown, A. (2022, November 7). Signs of Over-Fertilized plants and how to save them. Back Garden - Gardening Blog, Plants, Landscaping, Mushrooms. <https://backgarden.org/over-fertilized-plants/>**
- **No Author . (2023b, October 13). BYJUS. <https://byjus.com/biology/fertilizers/>. What are fertilizers? - Types, uses and advantages of fertilizers.**
- **Holegrape, J. (2023, November 18). Hydroponic Fertilizer: A complete guide for beginners. NutrientGreen.com. <https://www.nutrientgreen.com/hydroponic-fertilizer/>**

- Winter Greenhouse. (n.d.). How to create a Mason Jar miniature Garden - Winter Greenhouse. <https://www.wintergreenhouse.com/how-create-mason-jar-miniature-garden/a-341/#:~:text=Planting%21%20You%20will%20want%20to%20choose%20miniature%20plants,Baby%20Tears%2C%20and%20Hypoestes%20phyllostachya%20%28Polka%20Dot%20plant%29>
- Davis, T. (2021, March 29). Mason Jar Garden 6 Plants You Can grow. The Imperfectly Happy Home. <https://www.imperfectlyhappy.com/mason-jar-garden/>
- Young, E. (2024, January 24). 9 DIY indoor greenhouses. Family Handyman. <https://www.familyhandyman.com/list/diy-indoor-greenhouses/>
- Coleby-Williams, J. (2021, February 19). Perlite in potting mix. Gardening Australia. <https://www.abc.net.au/gardening/how-to/perlite-in-potting-mix/13172464>
- Mom
- Dad
- Sister
- Brother
- What is Perlite – Notes from school
- Bedre, R. (2021, October 10). Manipulated, response, and control variables [definition and research example]. RS Blog. <https://www.reneshbedre.com/blog/manipulated-variable.html>
- E. W. (2024, January 4). *Here's the scoop on chemical and organic fertilizers*. OSU Extension Service. <https://extension.oregonstate.edu/news/heres-scoop-chemical-organic-fertilizers>

Notes for me

- *Copy most of this on slide show
- *Use main points from each category for 5-minute pitch
- * Use a few more points for video if it is virtual; check in with Ms. Bretner for this
- *Organize citations in the correct way before putting on slideshow
- *DO NOT add any pictures on here add on slideshow
- *Make sure every slide has a picture except for citations
- *Try to add as my labels as possible
- *Add additional research from side-planning doc
- *Do not complete significant risk form (Told by Ms. Bretner)

- *Submit logbook once finished project to CYSF
- *Take picture of trifold and add it too “attachments” on the CYSF platform
- *Try to finish before term 2 starts
- *Check for grammar mistakes
- *Start thinking about next CYSF project once project is finished
- *Take lots of pictures as the project starts and finishes up
- *Write down visual and observations through microscopes, different
- *Make the trifold aesthetic

Side Notes

CYSF NOTES

- Mustard seeds grow well in many types of soils. Also, they are inexpensive and easy to grow. In case the experiment fails due to weather or any other error, we will easily be able to regrow them as they are cheap to buy and grow very fast as well.
- I will be using a mason jar that role plays as a tiny greenhouse, just like the ones real scientists use. It will keep the plant cozy and warm, like a snug blanket. This plant will grow with human assistance in providing its nutrients. Then another plant is like an explorer in the outside world, growing without any special help.As these plants grow, it's like a friendly race between them.I want to know who will win! Then I'll use a microscope to look at the tiny building blocks inside the plants, called cells. This helps me figure out which plant has the most healthy and nutritious cells.So, this experiment lets me learn about plants, how they grow, and which home they like best.
- I'll be utilizing a mason jar that doubles as a miniature greenhouse, just like real scientists. It will keep the plant nice and warm, similar to a warm blanket. This plant will grow with the help of humans to provide nutrients. Another plant, on the other hand, is like an explorer in the outside world, growing without any special assistance.It's like a pleasant race between these plants as they grow.I'm curious who will win! Then I'll look under a microscope at the microscopic building pieces inside the plants known as cells. This helps me in determining which plant has the most healthy and nutritious cells.So, this experiment allows me to understand about plants, how they grow, and which environment they prefer.
- I will cultivate 2 different mustard plants. I will grow them under the same natural conditions. However, I will take care of one of them and let the other one grow on its own. This will help us understand the role of humans in the growth of plants.
-

***In school science fair is on FEB 23 2024**

