Plants and Pollution

Abstract

This project investigates whether arugula can successfully grow in two different simulated polluted environments including a (simulated acid rain and roadside runoff) compared to a clean environment. To test this, I grew the plants under controlled conditions (65-70℉, consistent lighting and watering) I chose this project because of my interest in different types of climate change including pollution and the challenge of developing sustainable food sources for future generations. My results showed that while plants could grow in polluted environments, it significantly affected their growth especially the acid rain. This research is important as it helps address the challenge of growing food in our changing environment, a key factor for long-term plantation and colonization.

Background

- Air pollution negatively affects plant growth and health.
- Pollutants can block sunlight and interfere with stomata, which plants use to breathe.
- Air pollution can also change soil properties, making it harder for plants to absorb nutrients.
- Common signs of pollution damage include leaf yellowing (chlorosis) and browning (necrosis).
- Pollutants like ozone, nitrogen oxides, and sulfur compounds reduce photosynthesis.
- Reduced photosynthesis means plants produce less energy and grow more slowly.

Research Question

If humans want to keep growing enough healthy food on Earth, we need to understand how pollution affects plants. This research investigates whether different types of pollution can slow plant growth or damage the green color that plants use for photosynthesis. By studying how this can impacts our plants we can help scientists and our communities.

Investigative Methods

Variables:

1. Independent Variable: (Level of Lemon juice or salts in the water)
2. Dependent Variable: (Size of the plants, # of leaves and color)
3. Control Variables: (20°C), lighting (12 hours per) and watering (6 sprays a day).

Procedure:

1. Prepare Environments: Water with lemon juice, Soil with metal, Normal (unpolluted) environment
2. Plant the mustard greens in the different simulated environments
3. Controlled conditions: temperature (20°C), lighting (12 hours per), and watering (6 sprays a day).
4. Observe and record plant growth daily, measuring height and leaf development.
5. Compare growth results across different environments

Investigative Materials

Acid Rain (Water with Lemon Juice)
Roadside Runoff (Water with salts)

Arugula seeds (Ace Hardware 5 in each)

Planting containers
Measuring cup
Ruler
Grow lights (Amazon)
Watering Sprayer (Amazon)
Digital log for recording data (Google Docs)

Day 0

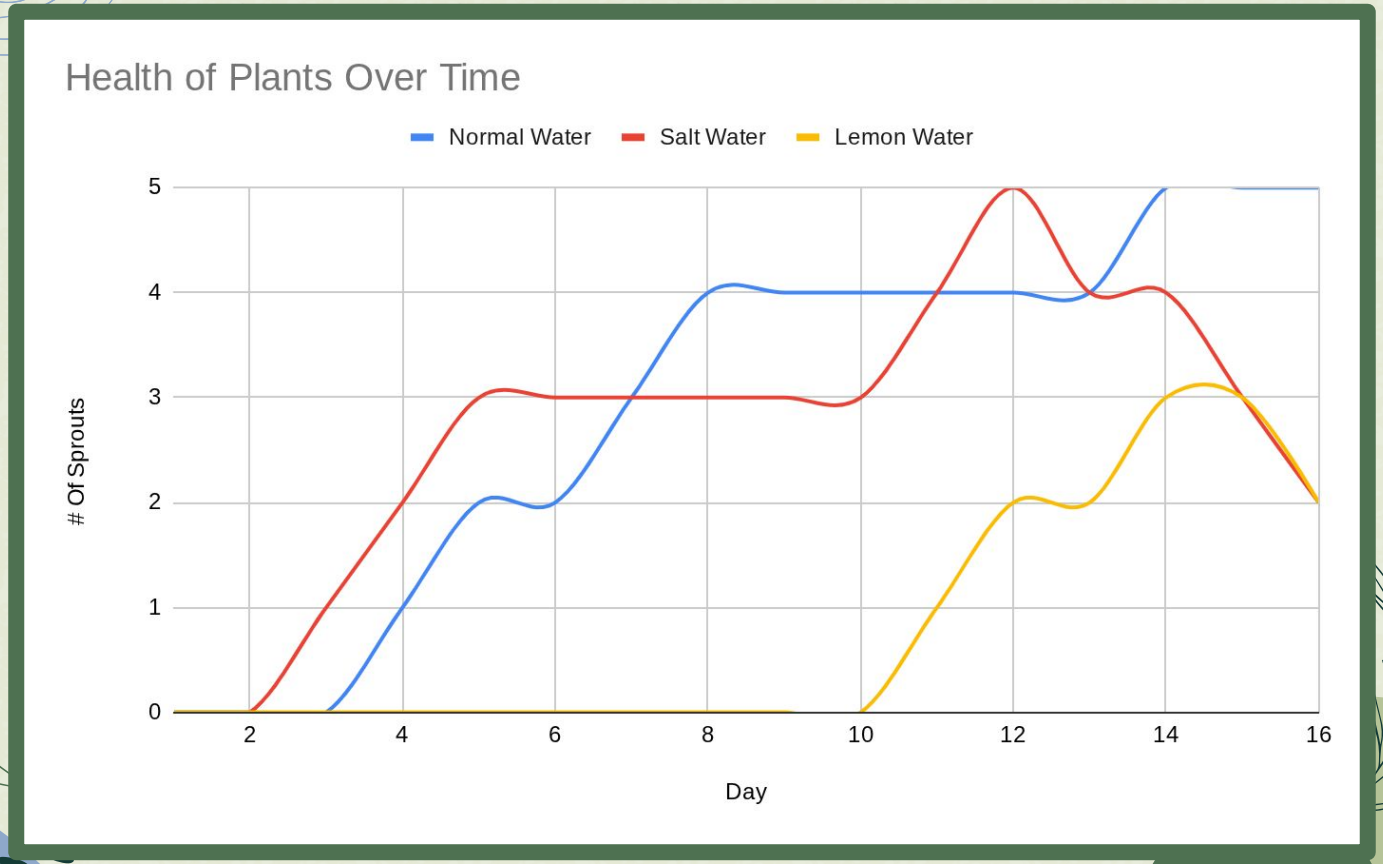
Planted the seeds in each planter and got all the grow lights hooked up to each one

Watering Plants
Photo by Parent Student in Picture

Planting Seeds
Photo by Parent Student in Picture

Plants With Grow Lights
Photo by Student

	Normal	Salt Water	Lemon Water
Day 3			
Day 10			


Health of Plants Over Time
Normal Water
Salt Water
Lemon Water
Of Sprouts
0
1
2
3
4
5
2
4
6
8
10
12
14
16
Day

Interpretation

The results of this experiment showed that **arugula grew best in the clean environment but sprouted quickest in the salt water**, while **plants exposed to simulated acid rain experienced reduced growth.** Overall, arugula grown in the clean environment developed more steadily and reached greater overall size compared to those grown in polluted conditions. Although arugula was able to sprout quicker in the salt water, its growth rate declined over time. These results suggest that while arugula can tolerate certain levels of pollution initially, polluted environments limit its ability to sustain healthy long-term growth once the plant has sprouted.

Interpretation

Potential sources of error included challenges in measuring fragile plants accurately.

For future research, it would be interesting to investigate the optimal water levels and type of soil modifications for growing plants in polluted environments. Additionally, conducting a longer experiment could be helpful to look at plant growth over an extended period.

Overall, pollution did not affect sprouting speed but significantly reduced plant growth.

References

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