The Color Code

Abstract

My research question is "How does light color affect plant growth?" My hypothesis was that the red color would grow the fastest and the blue color would grow more leaves. I also thought the plant under green light would grow slowest and grow smaller leaves. My hypothesis was incorrect because the red plant actually grew the largest leaves and the plant under neutral grew the smallest leaves.

Category

My my science fair project best fits under the category "Plants and the Environment".

Introduction

I decided to do this project because I thought it would be an interesting experience. My main question I had for this project was: "How does light color affect plant growth?" When I first started this project, I didn't know anything about my topic. I was also intrigued by the fact that some recent studies on this topic challenge the older, more traditional idea, stating that green light actually penetrates deeper into the leaf than normal white light. I think this topic could help communities to be able to grow vegetation for a multitude of purposes more efficiently, and even lowering the cost of fresh food. This alone could make food more readily available and affordable. I wasn't inspired by anyone in particular, more by by thoughts and questions. I knew experiments like mine have been done before many times, often by professionals, so my first question was: "how can I make my project different form most of the others?" my first idea was to test different types of a color (ex. Purple is widely known as the combination of red and blue, but purple actually has its own wavelength. From my research I know purple is often known as the best color for grow lights to promote plant growth because it is a mix of red (grows faster and taller) and blue (stokier, moreleaves, better CO_2 uptake) light colors. But would using the color purple with the specific wavelength give the same effect?).

Research

For my research, I mostly worked on finding out more about different wavelengths the different light colors had, and how chlorophyll reacts to different colors of light. I also researched how deep different colors of light can penetrate into the leaves of a plant. Through my research, I learned how red light grows plants most efficiently, and how blue light leads to larger leaves and better CO_2 intake, as it provides more high-energy photons. As the color purple can be created by combining red and blue light colors, I predicted that purple light would grow the plants best. Since most plants are green, and I know that objects reflect the color of light that we see, I predicted that the plant under green light would grow to be smallest.

Hypothesis

My hypothesis is that the plant under red light will grow fastest and largest overall, the plant under blue light will grow the largest leaves, and the plant under green light will grow the worst.

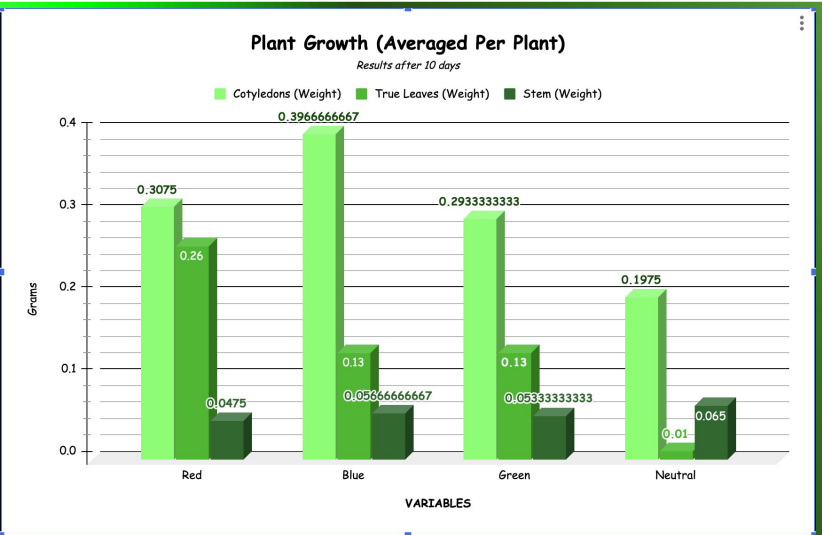
Procedures

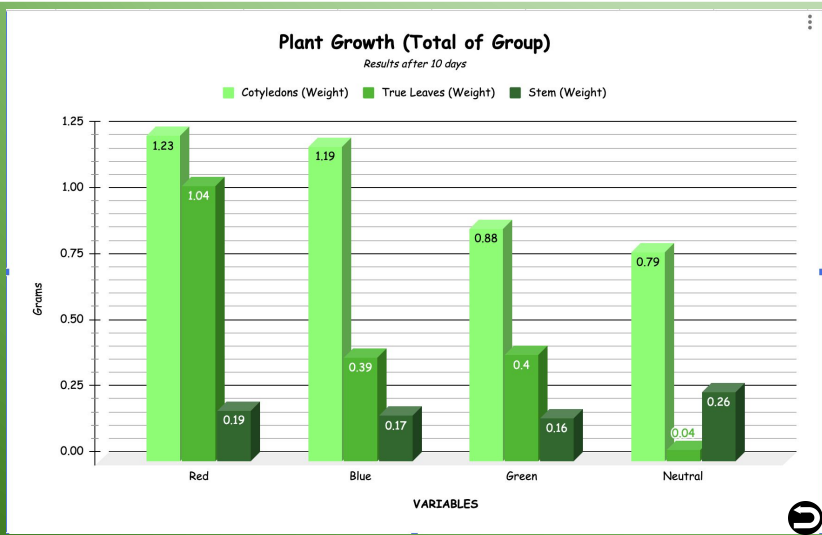
1. Plant 7 cups of radish seeds in plastic cups, 4 seeds per cup, watering regularly
2. After the majority of **sprouted** radish seedling reach at least 1 ½ inches tall, wrap sides of the cup in foil wrap and cover the top with 2 layers of colored cellophane, making sure to tilt it to an angle so it does not prevent sufficient airflow
3. Keep watering plants regularly, and measure plant height every few days.
4. At the end of the experiment, dissect all plants and measure the weight of each part (cotyledons, stem, true leaves), recording everything down. After dissection, discard specimens

RESULTS

The plants under the red light filter grew 1.23 grams of cotyledons total, averaging to 0.3075 grams of cotyledons per plant; 1.04 grams of true leaves total, averaging at 0.26 grams of true leaves per plant; and 0.19 grams of stem total, averaging to 0.0475 grams per plant.
The plants under the blue light grew 1.19 grams of cotyledons in total, averaging to ≈0.3968 grams of cotyledons per plant; 0.39 grams of true leaves total, averaging to 0.13 grams of true leaves per plant; and 0.17 grams of stem total, averaging to ≈0.0568 grams of stem per plant.

The plants under the green light grew 0.88 grams of cotyledons in total, averaging to ≈0.293 grams of cotyledons per plant; 0.4 grams of true leaves total, averaging to 0.13 grams of true leaves per plant; and 0.16 grams of stem total, averaging to ≈0.053 grams of stem per plant.
The plants under the white light grew 0.79 grams of cotyledons in total, averaging to 0.1975 grams of cotyledons per plant; 0.04 grams of true leaves total, averaging to 0.01 grams of true leaves per plant; and 0.26 grams of stem total, averaging to 0.065 grams of stem per plant..





Conclusion

My hypothesis was partially correct. The plant under green light did grow the fastest but had a surprisingly large amount of true leaves compared to the plans under other light colors, but the plant under neutral light actually grew the smallest true leaves, at 0.04 grams, instead of the green plant as I expected. I think this is because the neutral light filter reduced all light colors, opposed to the rest of the rest of the light filters, My hypothesis was partially correct. The plant under green light did grow the fastest and had a surprisingly large amount of true leaves compared to the plans under other light colors, but the plant under neutral light actually grew the smallest true leaves, at 0.04 grams, instead of the green plant as I expected. I think this is because the neutral light filter reduced all light colors, Which only reduced some colors, meaning the plants may have experienced etiolation (often called "leggy seedlings"). Etiolation happens when a plant senses there is not enough light, and the plant thinks there is a different plant above it, causing it to grow taller and grow very small or no leaves. If I could do this experiment again, I would plant more seedlings, as many cups of seedlings never reached the 1 ¾ inches ands some never even sprouted at all.I would also experiment with violet, magenta, yellow, orange, and no light ("vampire").

References

Links:
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