

The Effects of Different Colored Lighting on Basil Growth

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Abstract

We focused our project on the effects of different lighting on basil plants. We chose basil because of its ability to grow quickly and its similarity to other edible plants.. Our purpose was to see if an alternative type of lighting, other than sunlight, is more effective for plant growth. We also wanted to test how different lighting colors and wavelengths affect the basil plants. After conducting research we predicted white light would be most beneficial for plant growth and blue would help produce strong and sturdy stems, roots, and leaves. While red was expected to benefit the plant near the end of its growth cycle and ensure for healthy stem. This could assist farmers or other plant growers by increasing crop production. To test this, we isolated three groups with three basil plants per group and placed them in a cardboard box under either red, blue or white LED light. Every other day we uncovered the box in a dark room to water them and measure stem length. Then, we put our results into a data table that tracked progress over a four week period of time. Our results found the white light was most beneficial, as the plants under that light grew the most and tallest. The plants under the blue and red lights were very similar to each other because they both grew to around 7 cm and one plant in each of those groups did not survive. Overall we concluded that different colored lighting does have an effect on basil plant growth, with white light promoting the most overall plant growth.

Introduction

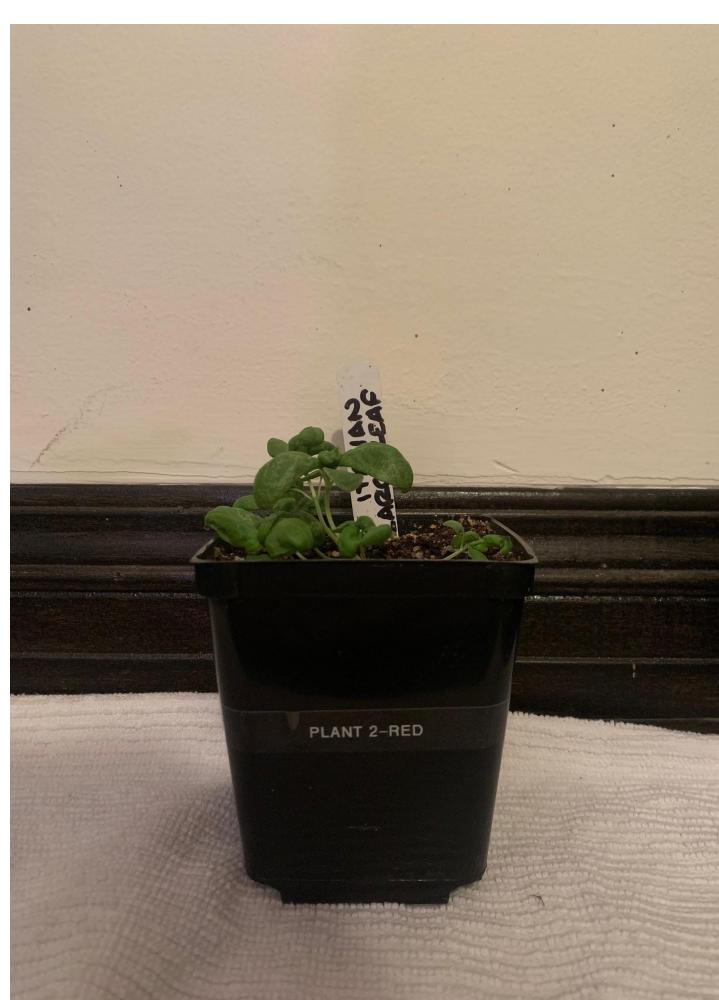
Our research project is based on how different colored lighting affects plant growth. We chose to do basil which takes four weeks to grow 10 to 15 centimeters. We chose to do the colors red, blue, and white because we thought that they would produce different outcomes. According to Lumi Growth's study, blue lights help the plant the most during the beginning of its growth and helps make the plants sprout. The blue light ensures healthy roots, healthy leaves, and strong stems. We are also testing how red light affects plant growth. We learned that it is important to have the red light on the plants towards the end of the growth process and that with some plants it helps the flowers bloom. Plants use wavelengths between 400 and 700 nanometers for photosynthesis, according to the San Francisco Gate newspaper, which provides all the energy the plant needs. Red light has a longer wavelength, so it promotes stem growth, flowering and chlorophyll production. Next, blue lights are in the part of the spectrum called cool light. The blue light simulates vegetation and strong root growth along with extreme photosynthesis. For our third color, white, we learned that it is a combination of different colors such as red, blue, and green, meaning that white is very beneficial for the overall plant growth. We expect the white light to be most beneficial for the plant growth because it is a combination of different colored lights and it is most beneficial for the overall growth of the plant.

Purpose

The purpose of planting 9 different basil plants under different colored lighting was to see the effect that the light had during the plant's growth stages. When we discover how different color lighting affects plant growth, it will help people who hope to grow plants and explore the best way to grow under artificial light. A secondary purpose is to better understand how to conduct a research project and collect data.

Materials and Methods

To start our project we first bought nine already sprouted basil plants in pots and separated them into three groups, which were exposed to different lighting. We made sure to have three plants in each group to account for any "defect" plants. Then we put them into a concealed cardboard box with their respective LED lights, and uncovered them every two days to receive 6 mL of water in a dark room. The lights were on from sunrise to sunset, which is about 13 hours, so the amount of light would be similar to plants that grow in natural conditions. During this time we took measurements of the length of the stem. We repeated this process everyday for four weeks until we had a sufficient amount of data. Also note that the sprouted basil plants had been in the nursery for approximately a week, in the sun, which is a factor we took into consideration.



Results

After four weeks we discovered that our hypothesis was supported and the plants under white light grew the fastest. The plants under the blue and red lights did not grow as much. Both only grew to around seven cm while the plants under the white light grew to 15 cm. Although the plants under the blue light were in an upward trend the whole time, the plants' average under the red light began to decrease because one did not survive and others began to die. Also, one of the plants under the blue light did not survive.

Discussion

From previous research we learned that different colored lighting was helpful in the growth of different parts of the plant. Plants that are grown in blue lighting should have strong stems and leaves, whereas plants grown in red lighting should help the plant in its early stages. It is essential to have red light if you want the plant to have strong roots. White lights give the plant an overall better growing environment. Our plants as shown did not represent how we thought the red and blue light would affect them because we thought that they would have stronger stems, leaves, or roots depending on which light they were under, but they did not. At the end of our date collection, the plants under red lighting had an average height of 7cm and 1 out of the 3 plants did not survive. The plants under the blue lighting had a final average height of 7.75cm. The white plants had an average final height of 14.86 cm. These results show that different color lights do affect the growth of basil plants in different and important ways. The white light showed a sustained, constant growth throughout the experiment as predicted. The colored lights were not as good at stimulating the growth of the plants, which is what we anticipated. After unsuccessfully trying to grow the lima beans, which rotted during the germination process, we attempted to grow basil plants from seed which also was ineffective. We came to the conclusion that we needed to buy pre planted basil that had just sprouted. But we needed to factor the possible extra sunlight they received while in the nursery into our project. We should've chosen a plant that grew faster so we could have collected more data in a shorter amount of time. Our experiment was to see which colored light is most beneficial for plant growth, a follow up experiment could be to put one plant under the sun to compare if artificial light or sunlight is more beneficial for the growth of the plant.

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