The Effects Of Different Color Light On Plant Growth!

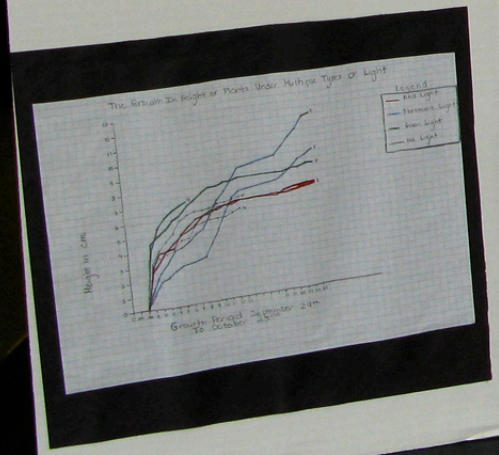
Lindsey Schloss
Daniel Steiman

Introduction

In order to introduce this lab one must first understand the basics of photosynthesis, light, wavelengths, and absorbance of photosynthetic pigments. As stated in the textbook Biology Today, "plants use the energy that they capture from the sun to make energy-rich carbohydrates by a process called photosynthesis" (Minkoff, 368). Photosynthesis occurs "in certain light-sensitive molecules called pigments, of which chlorophyll is the most important. Chlorophyll absorbs blue and red light but not green light" (Minkoff 369). Green light is actually reflected not absorbed. However, chlorophyll is not the only pigment found in plants. Carotenes and xanthophylls are also found in plants and can "absorb light of other colors and pass that energy onto chlorophyll. These pigments are useful because they enable it to use light energy of different wavelengths" (Minkoff 369). Photosynthesis directly affects the growth and health of a plant. Our experiment is to test the effects of manipulating the wavelengths of light, by placing Brassica Fast Plants under florescent light, red light, green light, and no light. Our hypothesis states that the plant exposed to the fluorescent light will grow the tallest, produce the most buds, and also produce the most flowers. The plant exposed to red light will have the second greatest growth in height, number of buds, and number of flowers. The plants exposed to green light will have the third greatest success in height, bud number, and flower number. The plant exposed to no light will have little or no growth and no flowers nor buds.

Resource:

Biology Today: An Issues Approach, Minckoff & Baker Garland Science: 2004.



Red Light	Brooks Soil	Height (cm)	# of Leaves	# of Buds	# of Flowers
Sept. 29th	-	-	-	-	-
Sept. 30th	Yes	0, 0	0, 0	0, 0	0, 0
October 1st	1	2.8, 3.0	2, 2	0, 0	0, 0
October 2nd	1	3.8, 3.5	2, 2	0, 0	0, 0
October 3rd	1	3.9, 3.7	2, 2	0, 0	0, 0
October 4th	1	4.1, 4.0	2, 2	0, 0	0, 0
October 5th	1	5.0, 4.6	3, 3	0, 0	0, 0
October 6th	1	5.4, 5.2	3, 4	0, 0	0, 0
October 7th	1	5.8, 5.5	4, 4	0, 0	0, 0
October 8th	1	6.1, 6.1	4, 4	0, 0	0, 0
October 9th	1	6.3, 6.2	5, 4	0, 0	0, 0
October 10th	1	6.3, 6.4	5, 4	0, 0	0, 0
October 11th	1	6.5, 6.5	5, 5	0, 0	0, 0
October 12th	1	6.5, 6.6	5, 5	1, 1	0, 0
October 13th	1	6.7, 6.7	5, 5	1, 1	0, 0
October 14th	1	6.8, 6.7	5, 7	1, 1	0, 1
October 15th	1	7.0, 6.8	6, 7	1, 1	1, 1
October 16th	1	7.2, 6.9	6, 8	1, 1	1, 1
October 17th	1	7.2, 7.1	7, 8	1, 1	1, 1
October 18th	1	7.3, 7.2	7, 8	1, 1	1, 1
October 19th	1	7.3, 7.3	7, 8	1, 1	1, 1
October 20th	1	7.3, 7.3	7, 8	1, 1	1, 1
October 21st	1	7.3, 7.3	7, 8	1, 1	1, 1
October 22nd	1	7.3, 7.3	7, 8	1, 1	1, 1
October 23rd	1	7.3, 7.3	7, 8	1, 1	1, 1

No Light	Brooks Soil	Height (cm)	# of Leaves	# of Buds	# of Flowers
Sept. 29th	-	-	-	-	-
Sept. 30th	-	0, 0	0, 0	0, 0	0, 0
October 1st	Yes	1.1, 2.5	1, 1	0, 0	0, 0
October 2nd	1	1.5, 3.3	1, 1	0, 0	0, 0
October 3rd	1	1.6, 3.9	1, 2	0, 0	0, 0
October 4th	1	1.7, 4.6	1, 2	0, 0	0, 0
October 5th	1	1.9, 4.9	1, 2	0, 0	0, 0
October 6th	1	1.9, 5.2	1, 2	0, 0	0, 0
October 7th	1	2.4, 5.6	1, 2	0, 0	0, 0
October 8th	1	2.7, 5.9	1, 2	0, 0	0, 0
October 9th	1	2.7, 5.7	1, 2	0, 0	0, 0
October 10th	1	2.7, 5.7	1, 2	0, 0	0, 0
October 11th	1	2.8, 5.9	1, 2	0, 0	0, 0
October 12th	1	2.9, 6.1	1, 2	0, 0	0, 0
October 13th	-	-	-	-	-
October 14th	-	-	-	-	-
October 15th	-	-	-	-	-
October 16th	-	-	-	-	-
October 17th	-	-	-	-	-
October 18th	-	-	-	-	-
October 19th	-	-	-	-	-
October 20th	-	-	-	-	-
October 21st	-	-	-	-	-
October 22nd	-	-	-	-	-
October 23rd	-	-	-	-	-

Green Light	Brooks Soil	Height (cm)	# of Leaves	# of Buds	# of Flowers
Sept. 29th	-	-	-	-	-
Sept. 30th	Yes	0, 0	0, 0	0, 0	0, 0
October 1st	1	4.1, 4.5	2, 2	0, 0	0, 0
October 2nd	1	5.0, 5.5	2, 2	0, 0	0, 0
October 3rd	1	5.5, 6.5	2, 3	0, 0	0, 0
October 4th	1	6.0, 6.8	2, 3	0, 0	0, 0
October 5th	1	6.5, 6.9	2, 3	0, 0	0, 0
October 6th	1	6.8, 7.2	2, 4	0, 0	0, 0
October 7th	1	7.0	4	0, 0	0
October 8th	1	7.6	4	0, 0	0
October 9th	1	7.9	14	1	0
October 10th	1	7.9	16	5	0
October 11th	1	8.1	16	9	0
October 12th	1	8.1	17	11	0
October 13th	1	8.3	19	13	0
October 14th	1	8.5	19	15	1
October 15th	1	8.8	19	16	1
October 16th	1	8.8	19	19	1
October 17th	1	8.8	110	22	1
October 18th	1	8.8	110	22	1
October 19th	1	8.8	110	22	1
October 20th	1	8.8	110	22	1
October 21st	1	8.8	110	22	1
October 22nd	1	8.8	110	22	1
October 23rd	1	8.8	110	22	1

Florescent	Brooks Soil	Height (cm)	# of Leaves	# of Buds	# of Flowers
Sept. 29th	-	-	-	-	-
Sept. 30th	Yes	0, 0	0, 0	0, 0	0, 0
October 1st	1	4.1, 4.0	2, 2	0, 0	0, 0
October 2nd	1	4.4, 4.1	2, 2	0, 0	0, 0
October 3rd	1	4.7, 4.3	2, 2	0, 0	0, 0
October 4th	1	5.0, 4.5	2, 3	0, 0	0, 0
October 5th	1	5.1, 4.7	2, 3	0, 0	0, 0
October 6th	1	5.3, 5.0	2, 3	0, 0	0, 0
October 7th	1	5.6, 5.2	2, 4	0, 0	0, 0
October 8th	1	5.8, 5.5	3, 4	0, 0	0, 0
October 9th	1	6.0, 5.8	3, 4	0, 0	0, 0
October 10th	1	6.2, 6.0	3, 4	0, 0	0, 0
October 11th	1	6.4, 6.0	3, 4	0, 0	0, 0
October 12th	1	6.5, 6.1	3, 4	0, 0	0, 0
October 13th	1	6.6, 6.2	3, 4	0, 0	0, 0
October 14th	1	6.7, 6.2	3, 4	0, 0	0, 0
October 15th	1	6.8, 6.2	3, 4	0, 0	0, 0
October 16th	1	6.8, 6.2	3, 4	0, 0	0, 0
October 17th	1	6.8, 6.2	3, 4	0, 0	0, 0
October 18th	1	6.8, 6.2	3, 4	0, 0	0, 0
October 19th	1	6.8, 6.2	3, 4	0, 0	0, 0
October 20th	1	6.8, 6.2	3, 4	0, 0	0, 0
October 21st	1	6.8, 6.2	3, 4	0, 0	0, 0
October 22nd	1	6.8, 6.2	3, 4	0, 0	0, 0
October 23rd	1	6.8, 6.2	3, 4	0, 0	0, 0

Results

All of the plants broke through the soil within one day of being planted with the exception of the plant growing in no light, which took two days.

The plants growing under florescent light grew the tallest, eventually reaching 12.1 and 9.6 cm. They did this at a relatively constant pace. The leaves began to appear on the plants under the florescent light within two days of being planted and increased gradually in numbers every few days. The buds did not appear on the plants under florescent light until about a week and a half into the growth process. However, the buds formed quickly and in large bunches. Flowers finally appeared two weeks into the growth of the plants in large numbers as well due to the large number of buds.

The plants growing under green light grew to be the second tallest out of the four types of light. At the end of three weeks the plant was 8.6 cm. The leaves began to appear two days into the growth process and the number of leaves increased gradually throughout the experiment. The buds materialized a week and a half after planting the seeds and appeared in large numbers. The flowers did not appear until two weeks after planting and were also high in numbers. The growth of the plant under green light was extremely similar to the growth of the plants under the florescent light.

The plants growing under red light grew to be 7.3 cm each. While their growth was constant, it was not nearly as quick as the growth of the plants under florescent and green light. The leaves of these plants appeared within two days and increased gradually. However, the amount of leaves on the red plant was less than that of the plants under green and florescent lighting after three weeks. The buds were present after a week and a half for one of the plants and about two weeks for the other plant. These buds came in fewer numbers than those of the green and florescent-lit plants. The flowers appeared in two weeks, but once again were significantly fewer in numbers.

The last plant was grown under no direct light and after two weeks grew to be 6.9 and 6.2 cm. However, after two weeks of growth the plants collapsed and died. The leaves appeared within two days in very low numbers, one at first and then eventually two. The number of leaves did not gradually increase. No buds or flowers ever appeared on these plants growing under no light.

Florescent light

The set up

Green light

red light

no light

Materials and Procedures

To test the hypothesis we planted four seeds of Brassica Fast Plants in each of our four quads. After building the two reservoirs with water mats to continually water the quads, we placed the quads in their under different types of light. One of the quads was placed directly under florescent light on the water mat. We placed another quad under red light by cutting out the bottom of a plastic cup and covering the opening with red plastic. We then poked some holes in the cup in order for the plant to have access to oxygen. We placed this quad under the cup with the red plastic on the same reservoir as the florescent quad. We repeated this procedure for our third quad, using green plastic this time. Our final quad was placed in a dark cabinet with no direct light on a separate reservoir and water mat. After a few days of growth we removed two of the plants from each of the quads, leaving two plants under each type of light: red, green, florescent, and no light.

The next step would be to periodically collect data on the growth of the different plants in their respective containers. Every day a member of the group would measure the height of the plant by holding the plant upright from where the stem of the plant met the soil to the highest point on the plant. The member would then count the number of leaves on the plants including both the real or actual leaves and the original or growth leaves. The member would then count the number of buds and flowers on each of the plants. Over fall break there was a four-day period when the group did not measure the plants. After one week of measuring the plants under green light, one of the plants in the quad was accidentally uprooted, and the group only had the one plant to measure from this point on. After about two weeks the plants growing under no light were no longer standing and died, therefore our group no longer measured those plants. From the data we collected, we would be able to conclude which plants grew faster and developed more, and how the amount of light they were getting was a factor.

Conclusion

Our hypothesis was supported in some aspects; however, it was entirely supported. Our hypothesis that the plants exposed to florescent light would grow the tallest with the most leaves, buds, and flowers was supported. Our hypothesis that the plants exposed to no light would grow the least was also supported. However, our hypothesis that the plants exposed to red light would grow taller and have more leaves, buds, and flowers than the green light was not supported. Because florescent light contains the entire spectrum of colors and wavelengths our plants exposed to fluorescent light were able to absorb the most light by chlorophyll and other pigments. Because the plants absorbed the most light, they were able to produce the most energy-rich carbohydrates allowing them to grow and produce flowers and buds.

It would be expected, however, that the plants not exposed to light would not grow at all because they would be unable to produce carbohydrates. It would also be expected that the plants exposed to red light would grow more than plants exposed to green lights because chlorophyll reflect green light and absorbs red light. However, none of those hypothesized events happened. The plants not exposed to light initially grew because they contained nutrients in their seed that allowed them to grow without light. These nutrients are needed so that plants will be able to break soil. These plants grew rather tall because they were attempting to eventually reach some sort of light source.

As for the plant exposed to green light, it was able to grow and produce flowers and buds because of the other pigments in plants such as carotenes and xanthophylls that pass the energy to chlorophyll. The plant under green light may have grown taller than the plant under red light because of its position under the light bank may have exposed more light to the green plant than the red plant. The length and frequency of the wavelength determine the color of light. These factors, along with amount of light a plant is exposed to, have a great impact on the successful growth of a plant.