

Supplemental Black Light Effect on *Brassica rapa*

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Abstract

Sunlight provides ultra-violet (UV) rays for outdoor plants. Over time, more UV rays are apparent through destruction of the ozone layer causing an effect on Earth. These effects being cancer, DNA damage, changes in life cycles, and as well as in crop growth (Brasseur 1987). In order to determine the UV light effect on plants, *Brassica rapa* was grown under an black light bulb receiving no other light. One group of *Brassica rapa* plants was grown under the black light with minimal white fluorescent light while another group was grown solely under white fluorescent light. The plants grown under the black light appeared to be shorter with thicker and larger leaves. The end results suggest UV rays disrupts plant growth in various ways.

Introduction

Black light contains ultra-violet rays which are also found in sunlight. Sunlight contains all the colors of the spectrum just like a fluorescent light. Yet, natural light also contains UV rays that white fluorescent light does not give off. Light has a strong effect on photosynthesis which plants undergo. Photosynthesis is a process plants taking in light and converts it to carbohydrates. Plant growth depends on both light and CO₂ given off from the environment as a necessity for the process (Schurr 2006). Where black light contains UV radiation, provided

through sunlight to plants outdoors, supplementing black light with white fluorescent light will add energy that fluorescent lights do not individually give off.

In photosynthesis one of the important steps is light intake, a reaction which converts energy from solar to chemical (Campbell 2008). The purpose of this experiment is to determine if black light has an overall effect on the growth of *Brassica rapa*, which has a short life cycle of approximately 35 days, by looking at height, number of leaves, number of flowers, number of pods, and number of seeds.

Materials and Methods

Brassica rapa seeds were planted and grown according to *Wisconsin Fast Plants Growing Instructions*. Two columns were divided consisting of four quads with four individual cells. Cardboard was placed in between each column protecting the controlled group from receiving any black light allowing just white fluorescent light to be presented. The experimental group received black light with minimal white fluorescent. Four seeds were added to each cell along with three fertilizer pellets allowing germination to begin. After germination, plants were thinned to leave one plant in each cell, and those without any plants were transplanted.

Each week the height of both the experimental and controlled group were measured. Alongside with height the number of leaves, number of flowers and number of pods were recorded. A short description of any distinctive data was also recorded. Dates were taken when germination, addition of the black light, transplanting, pollination, and harvesting occurred.

The final step, harvesting the plants consisted of removing each plant from the soil, rinsing any remaining dirt from the root then pressing a paper towel to dry and allow for a final measurement. Aluminum foil boats were made for each individual plant, labeled and weighed.

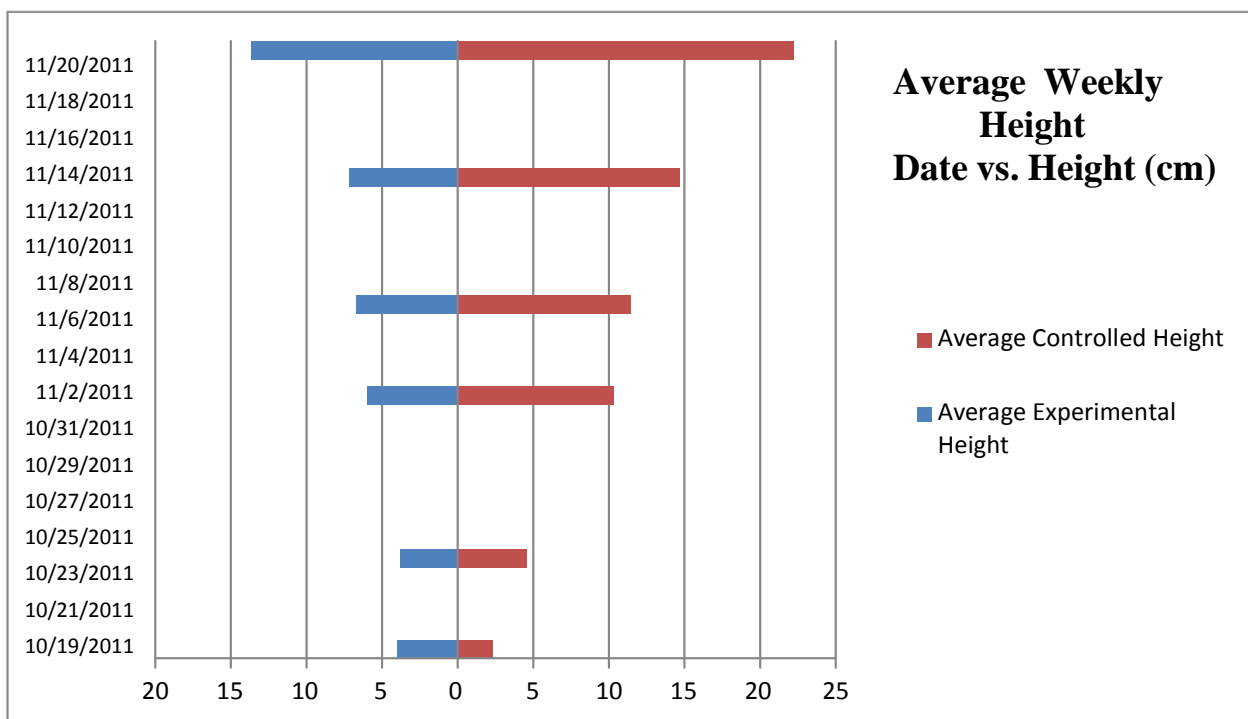
A plant was placed into each one and then into a drying oven for five days. The final weight of the dry plant in the boat was taken. The final plant weight was found by subtracting the boat weight from the final weight.

Results

The beginning stages of the plants, after germination, all appeared to have no significant difference. Once after transplanting many of the plants dried out and died on the controlled side. There was not a distinct difference as far as coloration, but the plants receiving UV rays appeared greener and thicker.

After a few weeks of measuring, the *Brassica rapa* plant receiving just fluorescent light had a height average much higher. They also appeared to dry out faster than those with black light. Although there was a scarce amount of plants growing under that condition enough data was collected to conclude that these plants overall had a higher height measurement. The experimental group receiving black light did not flower or appear to grow any pods. The leaves were a lot thicker and the plants grew in a horizontal direction intertwining with one another where as the controlled group thinned out and grew straight up with longer roots.

As far as comparing measurements taken, the experimental group did not meet expectations. Pods, flowers, and seeds were not present whatsoever in this group where it was in the controlled group. There appeared to be a significant difference in height between the two.



Above is a histogram displaying differences in height. Each week a measurement was taken of each plant per cell and labeled. Both a controlled as well as experimental heights were averaged per week and displayed above. Overall, the controlled group displayed higher numbers.

Discussion

Final results suggested that UV ray addition did not appear to be as effective as the plants just receiving white fluorescent light. Experimental results show to have a negative impact where no measurements of flowers, pods, or seeds were able to be collected.

To more fully understand the impact of supplementing black light on *Brassica rapa* further experiments should take place with emphasis that plants receiving black light are also

receiving a decent amount of white fluorescent light. Although through this experiment *Brassica rapa* showed significant differences, the experimental group did not receive a substantial amount of fluorescent light, therefore possibly causing an impact on plant growth and presentable data. By doing furthering this experiment, more accurate data can display not just the impact of plants receiving solely black light with inadequate amount of fluorescent light but also data such as leaf growth, seed numbers and other data that can be compared.

References

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