

Turn The Lights Down Low

The effect of different lights on germination

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Abstract: Successful germination process ensures that a plant is growing well and healthy, hopefully leading to a healthy crop. Light pollution is when a specific thing is being overpopulated by artificial light. Light pollution can affect the plant's germination process. Depending on the different lights a plant is exposed to can affect the growth of it. We predicted that the plant in 12-12 lighting would grow the most. Without plants our food chains would dramatically be affected and species and populations would die off. If our project is found successful the conditions a plant needs to survive will be revealed and it will impact the way we grow plants and the amount of plants correctly being grown throughout the world. To figure out if light pollution affects the germination and growth of plants we used three different light boxes, one with a very bright light for 24 hours, one with complete darkness 24 hours a day, and lastly a box with 12 hours of light and 12 hours of Darkness a day. We left the seeds in these boxes collecting data every day for 7 days and as the seeds were growing we collected data about how many square centimeters were filled in their plant containers. We also collected the height of each small container and found averages for every different light box. We found that the grass in the 24 hour darkness grew the most. The grass in the 24 hour light had the highest grass.

Introduction: The process of germination is when a plant grows from a seed into a seedling. The seeds need to be in good conditions to germinate properly including things like proper amounts of water, oxygen, soil, light and right temperatures. When exposed to proper conditions the seed takes in water and oxygen causing the cells of the embryo to enlarge, the seed then breaks open and emerges first followed by the shoot containing the leaves and the stem. Once leaves have sprouted sunlight becomes a primary energy source for plant growth through photosynthesis inside the seed coat there is an embryonic plant composed from a root stem and leaves as well as the food supply called the endosperm which nourishes the seed and allows it to grow the embryo plant absorbs the food supply and then the seed leaves or once it the leaves appear the plant begins to make its own food through the process of photosynthesis. Seeds are unique structures that can withstand harsh conditions and remain unseen until favorable conditions arise (GerminatingSeeds/extension.wvu.edu,2021). Different factors that are changed in the germination process can affect the plants growth and health. When plants are exposed to different types of factors they need to survive some plants might react or grow differently than others.


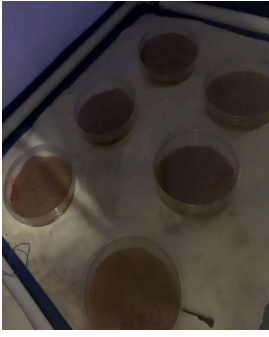
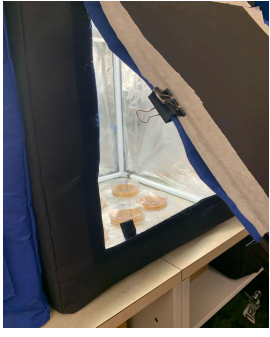
The importance for light during germination: Light can be essential for seed germination but most plants do not require it. Plants need soil and water and the seed germinates underground. However grass seed germinates on the surface of soil and light could be a factor. Some plants do better without light highlighting the importance of these elements

and plant growth. Seed germination is the process of seeds growing into mature plants influenced by environmental factors like planting temperature and humidity; planting can be classified based on type of germination. When a seed starts growing it absorbs water and which triggers some enzymes to start working these enzymes break down the stored food inside the seed which then helps with breathing nutrients then travel to the growing Parts like the stem leaves and roots with all this energy the seed starts growing up and down until it becomes a proper plant this is how the plant keeps themselves alive and keep on growing. (.www.geeksforgeeks.org/seed-germination,2023).There are 3 main parts of a seed: the embryo, seed coat, and endosperm. The embryo is the part of the seed that actually grows into a plant. There are 5 parts to the embryo: the epicotyl, hypocotyl, radicle, and cotyledons. The seed coat is the part of the seed you can see. It is the hard outer shell that protects the seed from not getting damaged. In some seeds the outer layer is softer. The endosperm stores the food in the seed it is around the embryo and gives the growing plant when necessary (<https://science4fun.info/seed-germination>) Light pollution is when a specific thing is being overpopulated by artificial light

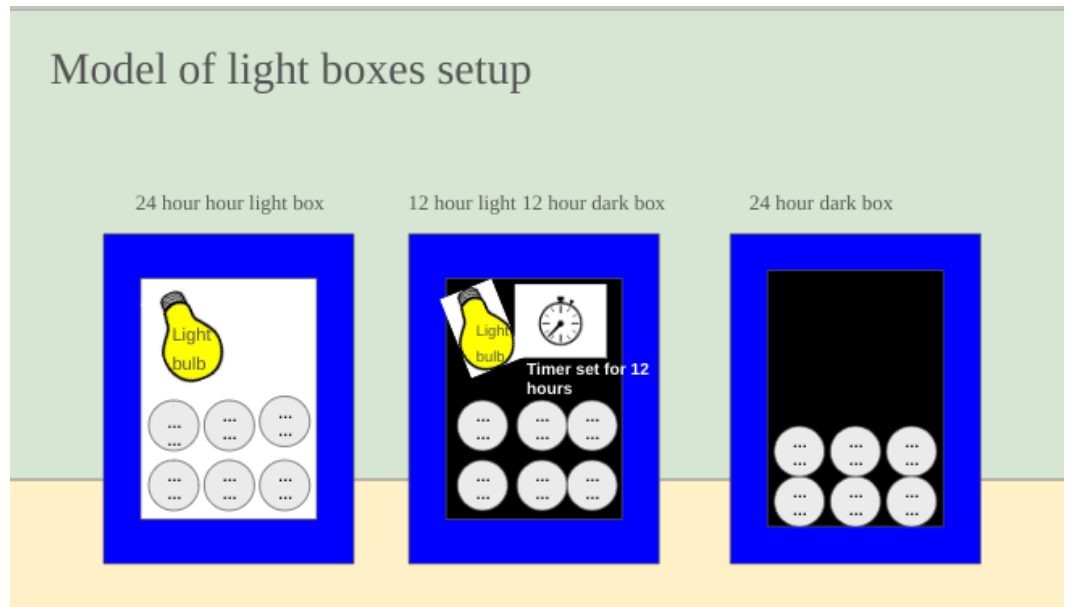
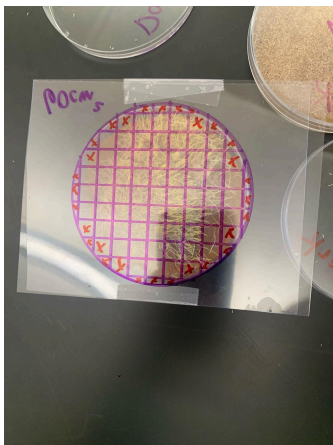
Hypothesis: Our hypothesis is that over the few days our seeds germinate, different lights that are exposed to the seeds will affect their germination. We believe that the plants in 12-12 lighting will grow the most compared to the plants in 24 hours of light and 24 hours dark. We believe this because some seeds and plants do not require light to grow.

Methods: The method we're going to use for our experiment is we are going to have 3 light boxes, one will be completely dark for 24 hours, one light for 24 hours and one with a timer for 12 hours light and 12 hours dark In each light box we will add 6 small plant containers. We are going to use germination paper and cut it down to size and place it in our containers. We will wet the paper with 6 ml of water and pour it in each of the containers. We will add 0.50 grams of

grass seeds into each container, and we will each square being 1 centimeter squared. The max a container of seeds can grow is 60 centimeters squared. We will leave the seeds in their proper light boxes for seven days, collecting data each day. We will then conclude which lighting is the best for the germination of plants.

Box with complete 24 hour darkness	Box with 12 hour light 12 hour dark	Box with 24 hour light
		

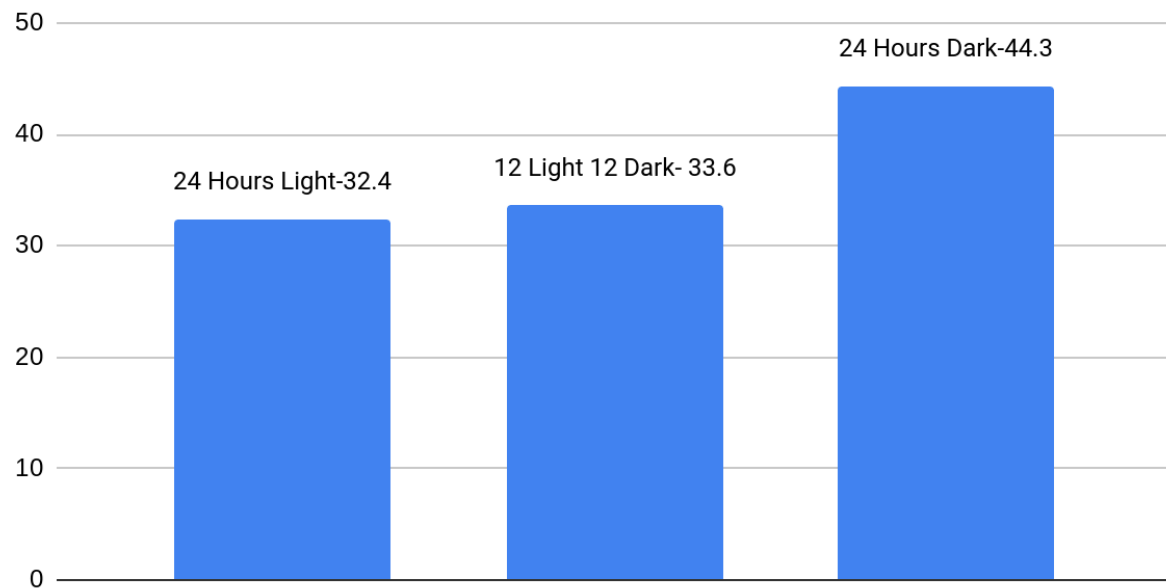
Graph used for taking data



We collected the growth by using a clear piece of plastic and a circle the shape of the containers. We made a graph with 60 little squares, each square being a square centimeter. The squares around the edges did not count as a complete squared centimeter because they were cut off.

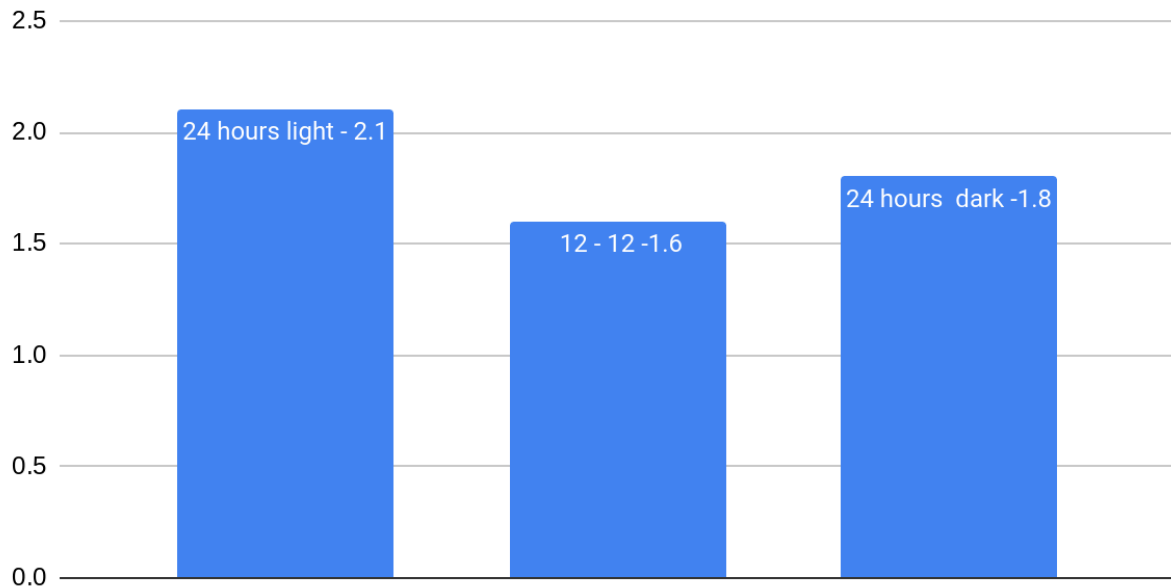
Averaged Data

In Cubic Centimeters



Height of grass in different lights

Height in centimeters



Future studies: In future studies we would look at different insects that live in plant soil, and how they affect the germination of different plants. We would also find out how the different insects including cockroaches, worms, and crickets living in the plants soil will affect plants overall health. Next time we would make sure to add more water, we noticed while taking data that some plants' germination paper was very dry which could have affected the growth of

different containers. We also would have made sure to evenly spread the seeds out as there were a few containers where the seeds were not spread out completely evenly.

Discussion

At the beginning of our project it took five days for any seeds to start growing. On day five the 24 hour light seeds were starting to grow and were averaged at 25 centimeters squared. The 12-12 lighting seeds grew slightly more at an average of 30.6 centimeters squared. But on the fifth day the 12,12 seeds were averaged at 41 centimeters squared. One seed container had completely grown to 60 centimeters squared which is the max amount of centimeters and two others were in the fifties. By the end of the experiment the 24 hour dark plants had an average size of 44.3 centimeters. There was a big jump of the grass in the 24 hour dark from day six to day seven ending the experiment. On the last day of collecting data we collected the height of the grass in the different lights. The average height in 24 hour darkness was 2.1 centimeters high. The 12-12 lighting had an average of 1.6 centimeters tall, being the smallest. The grass in 24 hour light was averaged to 1.8 centimeters tall. Overall the grass in 24 hour dark had the largest amount of grass and it was the tallest. Over the few days the grass changed color depending on the box of light it was in. The grass in 24 hour light was bright green, the grass in 12-12 lighting was an average green color. The grass in 24 hour light was a beige dead looking color. This happened because of the fertilization of the grass, the grass needs good fertilization in order to grow a nice green color. The grass was different colors because the grass that was beige did not get enough fertilization. This causes the grass to change into lighter green and beige.

End result: The end result of our experiment concluded that the seeds in the 24 hour dark lighting were the seeds that grew the most. The grass in the 24 hour darkness overall grew more than the seeds in the 24 hour light and 12-12 lighting. The plants in the other two boxes were a lot smaller. This outcome happened because seeds in their early stages have a limited chemical energy found inside their cells overall some plants don't need light to grow . Overall our hypothesis was right because we believed that the seeds in 24 hour darkness would grow the most.

Limitations

If we were able to re-do our experiment again, next time we would make sure to add more water. We noticed after a few days of taking data that some plants' germination paper was very dry which could have affected the growth of different containers. We also would have made sure to evenly spread the seeds out in their containers, as there were a few containers where the seeds were not spread out completely evening. For the dark box one day we noticed that the black cardboard that was taped on the mesh opening door of the box was not put on correctly. This resulted in a little bit of the room's light to be able to seep into the box.

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