

Effect of different lights and miracle grow on plants



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Research Question:

To what extent does different lights and miracle grow have on the effect of the roots of forsythia?

Background Information:

Forsythia are deciduous shrubs that are mostly native to eastern Asia. The Forsythia plant got its name from William Forsyth, a Scottish botanist. Leaves on Forsythia are opposite of one another and are quite simple looking. The plant is known for being a tough and reliable garden plant. Low hanging boughs often take root. It is suggested that cuttings be taken from November to February (University).

Parenchyma cells, also called ground or fundamental tissue, are mostly unspecialized cells, with thin and flexible primary walls. Most all parenchyma cells lack a second wall. These unspecialized cells carry out most of a plant's metabolic functions. Photosynthesis occurs within the parenchyma cells of plant leaves. Parenchyma cells make up the mesophyll and cortex of plant leaves and the pith of stems and roots of plants. The mesophyll of a leaf is the internal layers, while the cortex is the outside layers of a leaf. The pith of stems or roots is the most internal layer. Many plant cells that are developing, are originally parenchyma cells. They then started to develop into their specialized structure or function.

Collenchyma cells have unevenly thickened primary walls. However, there can be some secondary thickening. They provide support to the parts of the plant that are still growing and developing, particularly the young and not yet mature parts of a plant shoot and their leaves. The cell walls of

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collenchyma cells are composed of cellulose and pectin. Botanists tend to group collenchyma cells into four groups: angular, annular, tangential, and lacunar. Angular collenchyma cells are the most common type and their cell corners are thickened more heavily. Annular collenchyma cells have evenly thickened cell walls throughout. Tangential collenchyma cells have thicker cell walls only when they are parallel to the surface of the structure where they are present. Lacunar collenchyma cells contain thickening around the cell walls facing the inter spaces. Collenchyma cells are flexible and have the ability to elongate, in order to support the leaves and stems(Arrington).

Sclerenchyma cells are specialized cells for support. These cells have secondary walls hardened with lignin. Lignin is a complex organic compound that makes plants rigid and woody. When sclerenchyma cells are fully mature, they are dead. There are two types of sclerenchyma cells: fibers and sclereids. Fibers are elongated sclerenchyma cells and they usually occur in groups. They are found in most all aspects of the plant body, including the stem, roots, and vascular bundles in the leaves. Sclereids are irregularly shaped sclerenchyma cells. They have very thick and lignified secondary walls. They are found in different tissues of the plant such as periderm, cortex, pith, xylem, and phloem.

Monocotyledons, or monocots, are flowering plants that have only one cotyledon. Cotyledon is an embryonic leaf, or a seed leaf. Monocots have veins that are usually parallel. Their vascular bundles are usually arranged in complex ways. Their stem is usually unbranched and fleshy. The root systems of monocots are fibrous. They have floral parts that usually come in multiples of threes. The leaves of monocots are usually thin because the <https://assignbuster.com/effect-of-different-lights-and-miracle-grow-on-plants/>

endosperm to feed the new plant is not on the inside the seed leaf(refer to printed off charts).

Dicotyledons, or dicots, are flowering plants that have two cotyledons. The veins on their leaves are usually netlike. Their vascular bundles are usually arranged in a ring shape. Dicots typically have a tough stem. Their root system is a taproot, with smaller roots growing from it. The floral parts usually come in multiples of four or five(refer to printed off charts).

Plants also have meristems. Meristems are tissue in plants that contain undifferentiated cells, or meristematic cells. Meristematic cells are capable of continuous division, since they grow into a specialized structure later on. There are two types of meristems: apical meristems and lateral meristems. Apical meristems are located near the tips of roots and shoots and are responsible for primary growth, or growth in length. Lateral meristems are elongated and located in the shoots and in the roots. They are responsible for secondary growth, which is adding girth and strength to the roots and shoots.

A stem is an alternating system of nodes. Nodes are the points on a stem in which leaves, branches, or roots grow. The stem segments in between nodes are called internodes. The number of leaves that grow from a node can help determine of what species a plant is. Each plant has many nodes.

The morphology of plants reflect their evolutionary history as terrestrial organisms that must simultaneously inhabit and draw resources from two different sources: soil and air. The soil contains water and oxygen. The oxygen in soil is found in air pockets and it gives the plant the ability to <https://assignbuster.com/effect-of-different-lights-and-miracle-grow-on-plants/>

break down sugars and release energy to allow the plant to live and grow.

The water helps nourish the plants and helps it live and grow. The air(including sunlight), provides carbon dioxide for the plants. The air allows the plant to breathe and photosynthesize, to make food.

A cross section of a leaf allows one to view the three tissue systems of a leaf: dermal, ground, and vascular. The dermal tissue includes the upper epidermis, the lower epidermis, and the stomata, or guard cells. The ground tissue is the mesophyll, which contains the palisade parenchyma and the spongy parenchyma. These parenchyma cells are equipped with chloroplasts and they are specialized for photosynthesis. The vascular tissue contains the xylem and phloem, which are the plants "veins". The infrastructure of the vascular tissue acts as a skeleton that reinforces the shape of the leaf.

Dermal tissue, or the epidermis, is a single layer of tightly compacted cells that cover and protects all young parts of the plant, best known as the "skin" of the plant. Ground tissue is neither vascular nor dermal. Ground tissue has many functions such as photosynthesis, storage, and support.

Vascular tissue continues throughout the plant and is involved in transport of materials between roots and shoots. The veins of plants, which are the xylem and phloem, are within the vascular tissue. The xylem conveys water and dissolved minerals upward from roots into shoots. The phloem transport food made in mature leaves to the roots and nonphotosynthetic part of the shoot.

The epidermis of leaves and other photosynthetic organs pores are stomata, which supports photosynthesis by allowing the exchange of carbon dioxide and oxygen between the outside air and leaf's interior. Stomata is the main

avenue for water to exit leaves through evaporation. Stomata changes the shapes of the cell that border, stoma can close pores to minimize water loss in hot, dry conditions.

Transport in plants occurs on three levels: (1) the uptake and loss of water and solutes, absorption of water and minerals from the soil by cells of roots; (2) short-distance transport of substance from cell to cell at the level of tissue and organs, loading sugar from photosynthetic cells into sieve tubes of phloem; (3) long-distance transport of sap within xylem and phloem at the level of the whole plant. The start of transport in a whole plant starts when roots absorb water and dissolved minerals from soils. The water and minerals are transported upward from roots to shoots as xylem sap.

Transpiration occurs, the loss of the water from the leaves through stomata pulls up the xylem sap. The gas exchange occurs in the stomata, exchanging carbon dioxide for photosynthesis and expelling oxygen. Sugars are produced in the leaves by photosynthesis, then the sugar is transported as phloem sap to roots and other parts of plant. Ending back where roots exchange gases with the air spaces of soil taking in oxygen and leaving carbon dioxide, the gas exchange supports the breakdown of sugar, cellular respiration in the root cells.

Hypothesis:

The aim of the experiment was not only on rooting, but how it occurs by looking into the transpiration. As previously discussed, the plants with the most Miracle Gro quickly died. The roots of said plants were quite black and their leaves were droopy. However, the control, or the Forsythia with 60 mL of water, was the tallest and strongest. In addition, the control plant provided <https://assignbuster.com/effect-of-different-lights-and-miracle-grow-on-plants/>

a clearer example of lateral rooting. From this experiment, it is notable that Miracle Gro may be helpful for taller plants with need of a “ push” to grow. In the case of our Forsythia, the plants with less, or no Miracle Gro at all, were the healthiest.

The stomata count lab gave us a clearer understanding of the movement of water in and out of the plant. From this lab, connected this idea to the previous lab: Every time I came back to class, and observed our plants, we noticed less water in each tube. The plants with less Miracle Gro had less water, thus, more homeostasis. The plants with the most Miracle Gro seemed to have let water out, but let the salt and solutions in. Thus, there was little to no homeostasis.

Table 1: Variables

Type	Description	Reason	Use
Independent	The independent variables are variables that can be changes to test the dependent variables.	To test whether miracle growth changes the rate of growth and transpiration on a plant.	Using light and miracle growth as the dependent variables it can altered to different lighting and different

amounts.

Dependent	The dependent variable is the variable that is being tested and relies on the independent variable to have changed.	The dependent variable is the reason for the whole experiment. The hypothesis is centered around testing the dependent variable.	The dependent variables would be water and the plant itself because those are the only variables that aren't altered and that depend on the independent variables
Control	The variable that is not altered at all, the variable stays the same to see whether the dependent variable has	Is the variable to tell whether the independent variables has changed the dependent variables.	The plant that will stay the same which is some of the forsythia.

changed.

Materials:

- 24 large test tubes
- Four test tube holders
- Deionized water
- Miracle Gro (5ml, 10ml)
- Two micropipettes
- 24 branches of Forsythia
- Microscope
- Clear nail polish
- Blue dye
- Graphing Paper

Procedure: Lab #1

For the first lab, decided to use six tubes, with one Forsythia in each, for our results to have more validity. Each tube had 60 mL of water. However, the control tube was the only one that solely contained water. The other five tubes also contained water, but a specific number of Miracle Gro, in mL, was placed in each tube. For example, the second tube contained 55 mL of water and 5 mL of a water/Miracle Gro solution, the third tube contained 50 mL of water and 10 mL of water/Miracle Gro solution, etc. The aim of the lab was to determine the effectiveness of a stimulant in plant cell differentiation and cloning. The lab lasted an estimate of three weeks. We measured the plants to have the same amount of stomata dipped in water. The number of stomata dipped in water were four on each branch. Every Forsythia branch

weighed 6 grams. In addition, we tried to use Forsythia with 15-17 leaves to be as accurate as possible.

Procedure #2

By taking one of the leaves from one of the Forsythia used in the previous lab, our group aimed to count the number of stomata in a leaf to investigate more on the transpiration. I placed clear nail polish on the leaf. After the nail polished dried, I carefully removed the nail polish layer, as it contained most of the stomata. The role of the nail polish was to stick onto the leaf, thus, the stomata to stick on the layer. Then traced the leaf using graphing paper to cut a specific centimeter " square." Lastly, placing a blue dye on the square, and placed it under the microscope. After counting the number of stomata in that square, we had to multiply that to the total number of squares that were inside of the leaf from the graphing paper. The final amount was around 5,000 stomata.

Data Collected:

Each day I went back and water the plants with the same amount of water. I also so paid attention to root growth and the leaves. When the roots finally started to grow I begun to measure the root growth of each plant remembering to write down my data. It was too much for me to put the root growth of every one of the twenty-four plants, so i averaged the growth according to which variables it was. Being that they are in the same variable group that they are giving the same amount of miracle growth.

Table 2: Miracle growth in forsythia

Type	Week 1	Week 2	Week 3	Week 4				
Growth of roots (inches)								
	10 5 mL mL	10 5 mL mL	10 5 mL mL	10 5 mL mL				
Dependent	.75	.25	1	.5	2.3	.9	2.8	1.2
	inch	inch	inch	inch	inches	inch	inch	inches
Control	1.5 inches	2.8 inches	3.4 inches	5 inches				

Evaluation:

The lab investigation was limited in some ways. First, being that there was low ecological validity in the investigation since the experiment was done inside and not outside. Second, miracle growth isn't a substance that is naturally outside that can be tested. Third, the forsythias was clippings that was from an uprooted plant, as to measure the root growth, which couldn't be done if the experiment had high ecological validity.

The quantitative data collected is enough to support my conclusion of miracle growth affects the root growth of forsythia also that miracle growth mixtures slowly kills the forsythia clippings. The data also shows that miracle growth mixtures also controls the increase stomata and transpiration of the forsythia clippings.

Conclusion:

The goal of my experiment was to determine whether my hypothesis that miracle growth concentrations would not only help in root growth but also kill the plant also growing the stomata count and transpiration of the forsythia clipping. The experiment was done by comparing different concentrations of miracle growth and water to a controlled forsythia group. The experiment somewhat supported the hypothesis in the portion that concerns root and stomatal growth, not so in the killing of forsythia being as I didn't start early and didn't have time to determine whether the forsythia will die. The goal of the experiment was reach in a way that it could be seen that the strengths and limitations.

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