

Plant Growth Lab (a sample write-up)

QUESTION: Will warmer air temperature increase plant growth?

INTRODUCTION:

Pumpkins are known as annuals, a type of plant that freezes and dies in freezing temperatures found in cooler climates. Many such plants that vegetables and agricultural crops require a period of sustained non-freezing temperatures to produce their crop for harvest. Pumpkins need about 90-100 days from when seeds are planted until ripe pumpkins can be harvested. In climates with shorter growing seasons, annual plants can be started in pots inside and planted out after danger of frost has passed.

Light, carbon dioxide, and water are needed for plant growth so photosynthesis can take place. Plants also need specific minerals found in the soil, such as phosphorous, nitrogen, potassium, calcium, magnesium, and sulfur for making proteins and chlorophyll.

Plants also need enzymes to support chemical reactions used in processes of growth and tissue production. Enzymes are proteins that may speed up chemical reactions or allow the reactions to take place at lower temperatures because enzymes lower the activation energy needed to start the reactions. Enzymes can become denatured if the environmental temperature is too warm or too cold. Enzymes involved in photosynthesis and other cell processes work optimally at certain temperatures.

In this experiment pumpkin plants will be grown for a week in both a classroom setting and a greenhouse with a higher temperature than the classroom. Growth will be described by measuring height, mass, and number of leaves gained by plants in each situation.

MATERIALS: 2 identical plants, in identical pots with same mass of soil
Water, same amount for each plant
Triple beam balance
Ruler
Thermometer

PROCEDURE:

1. Pot plants in identical pots equal masses of soil taken from the same bag.
2. Obtain the mass of each plant with pot and record in the Mass Before column of Data Table 1.
3. Measure the height of each plant and record in Height Before column of Data Table 1.
4. Count the number of leaves on each plant and record in # Leaves Before column of Data Table 1.
5. Place the control plant in the classroom window.
6. Place the experimental plant in the greenhouse.
7. Add the same amount of water to each plant's pot.
8. Measure the temperature classroom and the greenhouse each day and record the temperatures in Data Table 2.
9. At the end of the week, measure the height, mass, and number of leaves on each plant and record in the columns of the data table labeled after.

DATA TABLE 1:

	Mass before (g)	Mass after (g)	Height before (cm)	Height after (cm)	# leaves before	# leaves after
Experimental plant (Greenhouse)	50.10	63.25	14	18	5	9
Control Plant (Classroom)	51.48	61.30	12	14	5	7

DATA TABLE 2:

	Temp Day 1 (°C)	Temp Day 2 (°C)	Temp Day 3 (°C)	Temp Day 4 (°C)	Temp Day 5 (°C)	Temp Day 6 (°C)	Temp Day 7 (°C)
Classroom	21.2	24.0	23.8	22.5	22.8	23.0	22.6
Greenhouse	35.0	34.5	34.8	35.2	34.5	34.8	35.2

CONCLUSION:

Claim: Pumpkin plant growth increases as the temperature increases.

Evidence: The control plant was kept at normal room temperature for one week. The experimental plant was kept in a greenhouse with a temperature warmer than the classroom by at least 10°C each day. The mass of the experimental plant increased from 50.10 g to 63.25 g, while the control plant increased from 51.48 g to 61.30 g. The experimental plant grew from 14 cm to 18 cm (increase of 4 cm), and the control plant grew from 12 cm to 14 cm (increase of 2 cm). The experimental plant got four new leaves and the control only got two new leaves. The experimental plant appeared healthier than the control plant, had more leaves, and grew taller than the control plant.

Reasoning: Enzymes involved in photosynthesis and cellular respiration function most efficiently within the warmer temperature range provided by the greenhouse. Warmer air can hold more moisture as humidity than cooler air, and plants need water to do photosynthesis.

Rebuttal:

Other factors in the greenhouse and classroom may have impacted growth. Plants need sunlight to do photosynthesis to get the energy to grow. There was more natural light in the greenhouse than in the classroom. Plants also need water to do photosynthesis. The greenhouse also likely had higher humidity than the classroom, so the plant would not have lost moisture as quickly. Temperatures were recorded at the same time each day in the afternoon, so the temperature could have varied in each environment at night. Only two plants were used in this experiment.

Reflection:

The measurements are only taken for one plant in each environment. At least 3 plants in each environment would have provided additional evidence; measurements from 5-10 plants in each environment would add still more evidence. Controlling for the moisture and amount of sunlight plants in each environment received would eliminate moisture and sunlight as variables.