

Climatic Adaptations

The plants, animals, and other organisms that inhabit a biome have become adapted to the climate that characterizes that biome. In turn, some organisms can modify the climate of a biome through modifying Earth's water cycle to best meet their needs. For example, rainforest plants transpire large amounts of water to the air, generating their own rain by returning water to the atmosphere.

Some biomes have a large number of microclimates. You might think that organisms from biomes with many microclimates can tolerate larger differences in temperature and precipitation than those living in biomes with less variable climates. Is this assumption correct? Do plants that have adapted to a certain climate respond differently in another kind of climate? In this lab, you will hypothesize how different types of plants might respond to changes in environmental temperature. You then will test your hypothesis by attempting to germinate seeds of these plants under varying temperature conditions.

OBJECTIVES

Hypothesize how temperature affects seed germination.

Experiment to determine if your results support or refute your hypothesis.

MATERIALS

- filter paper (36 pieces)
- fine-tipped permanent marker
- incubator
- petri dishes, small, with lids (12)
- refrigerator
- seeds from various garden plants
- self-sealing plastic bags, large (6)
- thermometers
- water, distilled (0.25 L)



Procedure

In this laboratory activity, you will germinate seeds from at least two plant species that prefer warm environments and at least two plant species that prefer cool environments. Some suggestions for warm environment species include tomatoes, peppers, watermelons, pumpkins, cucumbers, beans, and squash. Varieties of plants that prefer cool weather include lettuce, celery, spinach, endive, radishes, beets, turnips, broccoli, and parsnips.

1. Use what you know about biomes and their dominant plants to develop a hypothesis about how you think temperature might affect seed germination.

Climatic Adaptations *continued*

2. Moisten the filter paper with distilled water.
3. Line each of the petri dishes with two or three sheets of moistened filter paper.
4. Place 10 seeds of a selected plant into each of three petri dishes, for a total of 30 seeds used. Label the plant type and environmental temperature on each dish with the fine-tipped marker. One petri dish will be kept in an incubator at 38°C. The second petri dish will be kept at approximately 22°C (room temperature), and the third dish will be kept in a refrigerator for 16 hours per day and at room temperature for 8 hours per day.
5. Repeat step 4 for the three other plant varieties you are studying.
6. Put each petri dish of seeds into a self-sealing plastic bag to prevent the seeds from drying out. Seal each bag completely.
7. Keep each bag of seeds at their designated temperatures for the next 10 days.
8. Observe the seeds daily, writing your observations in your science notebook.
9. After 10 days, record the number of seeds that germinated—sprouted roots and shoots—in the table. Also note if any seeds died or became infected with mold.
10. Combine your data with the data from other groups of students in the class. Use the combined data to answer the following questions.

DATA TABLE: SEED GERMINATION SUCCESS AT VARIOUS TEMPERATURES

	Alternating temperatures (7°C to 22°C)	Warm temperature (22°C)	Hot temperature (38°C)
Cool weather seeds			
Cool weather seeds			
Warm weather seeds			
Warm weather seeds			

Climatic Adaptations *continued*

Analysis

1. Describing Events How do your results compare with your hypothesis?

2. Recognizing Patterns Which seed varieties germinated best in the cool environment?

3. Recognizing Patterns Which seed varieties germinated best in the warm environment?

4. Analyzing Results Which seed varieties germinated in the widest temperature range?

Conclusions

5. Interpreting Information Which environment allowed the most seeds to germinate?

6. Making Predictions Which seeds would do well in a tropical climate?

7. Defending Conclusions Does temperature affect the germination of seeds? Explain.
