

Comparing Leaf Size and Shape

Grade Level: 7th - 12th; **Type:** Life Science

Objective:

Student will compare the tree leaf size and shape based on the leaf's position in the tree.

Research Questions:

- Why does transpiration occur?
- Why can too much light and heat cause a problem for trees with excess transpiration?
- How does photosynthesis work?
- Do leaf sizes and shape vary according to their position on the tree?
- What are the differences between shade and sun leaves?



Trees are complex organisms that exhibit many adaptations to their environment. One adaptation is leaf size and shape. Leaves high in a tree receive much more light and lose more water due to wind and heat. Sun leaves, as a result, are usually smaller with less surface area to protect them from water loss. Shade leaves, however, receive less light and need more surface area to conduct photosynthesis effectively. In this experiment, the student will gather leaves from different heights and different trees to compare the sun and shade leaves.

Materials:

- Tree identification field guide or key
- Digital camera (optional)
- Ladder, climbing equipment, or long-handled tree trimmers
- 20 ft. measuring tape
- Plastic zipper bags
- Graph paper with 1 cm squares (also available for printing online)
- Pencils

Experimental Procedure:

1. Chose three deciduous tree species that are small to medium in height, that you can reach with the equipment you have available. You will need to safely obtain leaves from the tops of the trees, so consider this when choosing trees. However, do not choose small saplings for this experiment.
2. Create your hypothesis. Do you think the leaves will be noticeable different in the higher parts of trees compared to the lower leaves? Why or why not? Do you think that this difference will be dependent on the species of tree? Why or Why not? Base your hypothesis on the differences in shade and sun leaves and the drought and shade tolerance of trees.
3. With adult help, carefully collect your leaf samples. You may want to take pictures of the process for your project display. Beginning at the lowest leaves, collect 10 leaves and place them in a plastic bag labeled with the height and tree species. You may use tree trimmers with an extension handle to trim small sections of tree branches to collect the leaves. You may alternately use a ladder or other climbing apparatus to hand collect the leaves. Stay in approximately the same position relative to the trunk of the tree as you collect leaves higher in the tree. Collect leaves at 1 meter intervals, using the meter tape to measure the height at which you are collecting. Continue to collect 10 leaves and place them in labeled plastic bags as you go up the tree. Repeat this procedure to collect leaves on the other two tree species.
4. After you have safely collected all of your leaf samples, trace each leaf onto a piece of graph paper that has 1 cm² squares. Be sure to label each piece of graph paper with the tree and height at which the leaves were collected. You may trace multiple leaves on the same piece of paper, provided they are collected from the same tree and height and do not overlap.
5. Count the number of whole squares occupied by each leaf and write the number on your data table. To simplify the measurement, do not count partial squares. Obtain an average leaf size measurement for each height of each tree species. Also write a brief description of the leaves at each height, noting any trends you observed. Create a line graph of your average leaf sizes, with height on the X-axis and average leaf size on the Y-axis. Compare your results to your hypothesis and draw conclusions about the differences in sun and shade leaves in the species you observed.

Terms/Concepts: Photosynthesis; Transpiration; Sun leaves; Shade leaves; Drought tolerant tree species; Shade tolerant tree species

References:

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