



EXPLORING TRANSPIRATION

Get out of the house and into nature with this simple backyard project

By using just a few plastic bags and the plants in your own garden, on your windowsill or just outside your door, you can explore the process called transpiration. Plants take up water through roots and then release it through microscopic holes called stomata. A big plus: You'll get a nice dose of fresh air and some sun to add to your indoor studies.

GATHER THIS:

- Large, clear plastic bags
- Twist ties

THEN DO THIS:

1. For fastest results, do this activity midday on a warm, sunny day.
2. Choose several different types of plants you have access to that do not have any water or dew on them.
3. Slide a plastic bag around a branch or some of the leaves in the sun and secure it with the twist tie. (Option: Repeat on the same type of plant in the shade.)
4. Make sure there are some leaves in each bag and that the twist tie is snug to the branch.
*Do not remove the branch or leaves from the plant
5. Repeat on different types of plants.
6. Make initial observations of each bag.
7. Come back every 30 min for the next couple of hours. Make more observations.
8. Remove the bags after a few hours and feel what has accumulated inside the bag.

TRY THIS:

- Try on a plant with thick or shiny leaves; on a plant with large, broad leaves; on a plant with fuzzy or hairy leaves; on a plant with leaves that aren't green.
- Which plant transpired the least/most?
- What does the inside of the bag look like after 30 min? 60 min? 90 min?
- Bonus: Add a thermometer to the inside of a bag and let sit for 30 min.
- Try this during the night!

(continued)



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SCIENCE
PLAYGROUND
& ZOO

WHAT IS HAPPENING?

Transpiration is the process by which water is pulled from the roots of the plant through the stems and leaves and released through microscopic holes in the leaves called stomata. The water is pulled up, against the force of gravity because of the interplay of two forces: cohesion and adhesion. Cohesion is the force that causes water molecules to stick to each other and adhesion is the force that causes water to stick to other materials. Cohesion keeps the water in the xylem of a plant stuck together so that when a water molecule evaporates out of the stomata, it pulls on the water molecule behind it, and so on, all the way down to the roots. Additionally, the water sticks to or adheres to the xylem walls and exhibits capillary action whereby water rises into a narrow tube against the force of gravity.

The rate of transpiration is directly related to the number and size of the stomatal openings, and to the evaporative demand of the atmosphere surrounding the leaf. The atmospheric conditions that influence the evaporative demand and the rate of transpiration are light intensity, temperature, humidity and wind speed. A fully grown tree may lose several hundred gallons of water through transpiration on a hot, dry day. The rate of transpiration also depends on the type of plant. Succulent plants have much slower transpiration rates because of a thick, waxy coating on the leaves. That thick, waxy coating is why succulent plants are well adapted to live in arid regions like deserts with minimal water.



WHAT THIS TEACHES:

Skills: Observations skills

Themes: Plants, adaptations, water