Thousand Pines Outdoor Science School
Crestline, CA
ThousandPinesOutdoorEd.com

How is water transported in a plant?

Objective: Be able to identify and describe the method by which a plant absorbs and transpires water
Time: 1 hour for transpiration section; 24-48 hours for absorption section.
Materials needed:
- 1-2 small cup half full of water
- A few drops of food coloring, preferably a darker color like blue or red.
- 1-2 celery stalks, freshly cut
- Small clear bag
- Rubber band or string
- Paper and writing utensil

Write down your hypothesis (educated guess) for these questions:

1. Where does a plant get its water?
2. Where does the water go once it is in a plant?

Absorption: Water into plants
Take one stalk of celery and make sure it is freshly cut ½-1" above the bottom. Place it in a cup of water as well as a few drops of food coloring. Place the cup and celery in a warm sunny spot and return to it every few hours for a day or two. On your paper answer these questions:

3. What do you think will happen to the celery?
4. Write down your observations at the following times. If you can't make an observation at the exact time, that's okay - try to be close, and write down the actual time you made your observations.
    a. 0 minutes after:
    b. 1 hour after:
    c. 12 hours after:
    d. 24 hours after:
    e. 48 hours after:

When you are done with these observations, pull out the celery and make some additional observations:

5. Where on the celery is the most color visible? Where does the celery seem unchanged?
6. Look at the bottom of the celery - what do you see, and what do you think it is?
7. Try to pull out some of the veins - is it easy to do? What do you see?

You are observing the *xylem* (zEYE-lum) of the plant. This is a structure that transports water and other nutrients up to the rest of the plant. There is a similar structure, the *phloem* (Flow-em), that transports sucrose down to the rest of the plant to be used as energy.

If you have extra time and supplies, try some of these further experiments or try your own!

- Use another plant for this - try lettuce, green onion, a flower, or maybe some grass from outside.
- Can you partially split the base of another piece of celery and have only one in colored water? Can you place them in two different colored water cups while still keeping the celery mostly intact?

Transpiration: Water into plants

While you can do this part of the experiment with the same piece of celery that you are using for absorption, we suggest using a separate one so that so that your experiments don't interfere with each other.

Put your clear plastic bag over the top of the celery and close it tight with the rubber band. You want to have lots of green leafy parts inside the bag. Place the celery in a warm, sunny place. While you wait, write down your hypothesis for each question:

1. What will happen to the air in the bag?
2. What will happen to the celery in the bag?

Go back after about an hour and write down your observations. Did they match your hypothesis?

You're observing *transpiration*, which is when a plant releases water into the air from its leaves. As it evaporates out of the leaves, it creates a flow of water up from the roots, kind of like a big straw, which is how the tree gets the water and nutrients that are in the ground. Transpiration is similar to the water moisture in your breath, which you can sometimes see when it is very cold outside.

If you have time, try some of these other experiments, making a hypothesis for each one, or make your own experiments too. If you use other plants, try not to damage any plants - put the bag directly on the plant, instead of pulling off leaves and branches for the experiment. Don't forget to remove the bag when your experiment is done for the same reason.

- Does the amount of sunlight on the bag make a difference in how much water you see transpired after an hour?
- How does the amount of leaves inside the bag affect the transpiration?
- Does the kind of plant used affect the transpiration? What kind of plants or leaves do you think will have more or less transpiration?

Summary:
Water is absorbed by a plant from the soil through its roots. That water is transported through the plant and used to help the plant grow, and excess water is released through transpiration into the air.