Celery Soaks It Up

from Celebrating Chemistry
Chemists Celebrate Earth Day

Plants need water and nutrients to live. You probably also know that most plants are found growing in soil. How is it that plants get nutrients and water from the soil throughout the plant? Do the water and nutrients travel in a special place in the stem, or go everywhere in the stem at once? Do other chemicals and nutrients that mix in the water travel from the soil up the stem too, or just the water? This experiment will help you find out.

Materials

- 4 clear 8 oz. plastic cups
- Water
- Red and blue food coloring
- 4 similar size stalks of celery with leaves (pale green inside stalks are best)
- Kitchen knife for adult partner
- Metric ruler
- Paper towels
- Pen
- Clock or timer
- Vegetable peeler

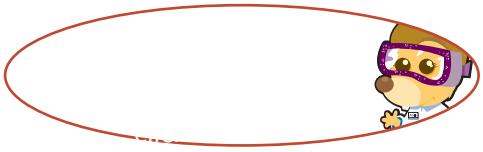
NOTE: A magnifying glass and a flashlight may help participants better view the celery.

Celery that is slightly wilted will take up the water more quickly. Measurements may be taken in 5 minute intervals and total time for the activity may be reduced.

Make sure that the celery will not knock over the cups. If this seems possible, prop the celery in the cup against something so that it does not fall over and spill the colored water and/or use clay or museum wax to hold the cups in place.

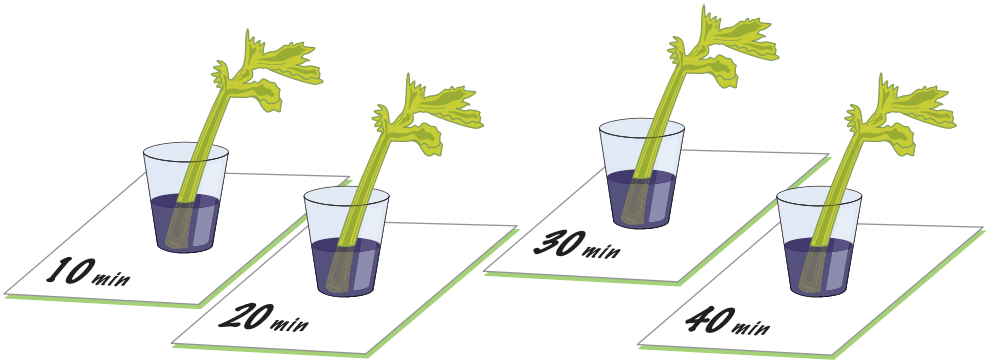
ADAPTATION *Instead of celery, use white carnations with 15 cm (6 inch) stems placed in water colored with 20 drops of food coloring. Have participants observe the color of the flowers when the carnations are first placed in the water. Schedule times during the day for the participants to check on the flowers. The flowers will begin to show some of the food coloring on the petals after about three hours. The effects will become most noticeable after eight hours or overnight.*

SAFETY! *Be sure to have your adult partner do all of the cutting and peeling in this activity! Follow Milli's Safety Tips and do this activity with an adult! Do not eat or drink any of the materials in this activity!*



Procedure

1. Fill each cup halfway with water.
2. Add 10 drops of red and 10 drops of blue food coloring to every cup to make purple water.
3. Lay the four pieces of celery in a row so that the leafy parts match up.
4. Have your adult partner carefully use the knife to cut the ends of the celery so that the stalks all measure 15 centimeters (6 inches) in length.
5. Use the pen to put a label on each paper towel. Label one "10 minutes," the next, "20 minutes," the third, "30 minutes" and the last one, "40 minutes." White paper towels without patterns will provide a good background for your observations.
6. Put one stalk in each cup of purple water, and record the time you put them in the purple water in the "What Did You Observe?" section.



7. Ten minutes after you put the celery into the cups, remove one of the stalks from the water and place it on the towel labeled "10 minutes."

8. Ask your adult partner to peel the rounded part of the celery stalk with the vegetable peeler. This will let you see how far up the stalk the purple water has traveled.

9. Measure the distance the purple water has traveled up the stalk and record this amount in centimeters in the "What Did You Observe?" section.

10. Repeat steps 8 and 9 after 20, 30, and 40 minutes have passed, placing the celery on the appropriate towel for the time, and recording the distance the water traveled up the stalk in the proper space on the chart.

11. After recording the last set of data, have your adult partner help you create a bar graph showing the distance the purple water traveled up each stalk versus time in the "What Did You Observe?" section.

12. When finished, be sure to throw the celery away, thoroughly clean the work area, and wash your hands.

Try this...

The celery may be put back in the colored water for several more hours or overnight for students to observe again. The color should have traveled all the way to the ends of the leaves, and the progression of the color could be observed and discussed without graphing.

Where's the Chemistry?

Water has special properties. Water sticks to itself, like when rain falls in drops, and it sticks to other surfaces. These properties are cohesion and adhesion. The cohesion and adhesion of water molecules help them to move up very thin tubes like those in a plant. When water moves into tiny spaces like that, we call it capillary action. In this activity the color in the water moved up into the celery with the water, because the water molecules attached to the coloring and brought it along. In nature, the water moving into a plant brings with it nutrients from the soil. These chemicals can help a plant live, but sometimes they make the plant sick as well.

The fact that plants bring water and other chemicals from the soil is sometimes used by humans to help them. In Iowa, poplar trees have been shown to reduce levels of nitrates, which come from fertilizers on some farms. In California, mustard plants soak up selenium, and in the Ukraine in Eastern Europe, sunflower roots dangling in ponds near the location of the 1986 Chernobyl nuclear power plant accident draw uranium from the water.

What Did You Observe?

Start time:

CELERY DATA CHART

Time (minutes):	0	10	20	30	40
Distance purple water traveled up the stalk in centimeters	0				

CELERY GRAPH

Graph the distance traveled by the purple water in each stalk against the time on the celery grid below.

Distance traveled by the water in centimeters

15				
14				
13				
12				
11				
10				
9				
8				
7				
6				
5				
4				
3				
2				
1				
0				
Stalk	1	2	3	4

The American Chemical Society develops materials for elementary school age children to spark their interest in science and teach developmentally appropriate chemistry concepts. The *Activities for Children* collection includes hands-on activities, articles, puzzles, and games on topics related to children's everyday experiences.

The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

Find more activities, articles, puzzles and games at www.acs.org/kids.

Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

Never eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

Never experiment on your own!

For more detailed information on safety go to www.acs.org/education and click on "Safety Guidelines".