NUTRIENTS FOR LIFE NUTRIMENTS POUR LA VIE

HERE'S A LESSON WORTH TEACHING

Lesson # 3

From Roots to the Plant

Demo Appropriate for All Ages
Explanation Appropriate for High School

SUPPLIES NEEDED

Water glass
Water
Food Colouring
Stalks of Celery (approximately 5-7cm long)
Carnation flowers (with 5-7 cm long stem) may be used
(we recommend white or yellow colours)

OVERVIEW

In order to understand how water and the nutrients dissolved in the water, are moved within a plant, students must first understand the interaction between the plants and the soil. (See Lesson 2)

In Lesson 2 we learned that plants move water, and the nutrients dissolved in the water, into the root system using both passive (no energy required) and active

transport (energy required). Lesson 2 highlights DIFFUSION, a form of passive transport involving the movement of substances from an area of high concentration (there is a lot) to an area of low concentration (there is little or none of the substance). But how does the plant move water and nutrients once they are in the root cells? This activity demonstrates transport of water through the XYLEM VESSELS by using celery and food colouring.

PRIOR TO THE EXPERIMENT

Ask your students, "How does water, and the nutrients it contains, get from the roots to the rest of the plant?" Predict what will happen to the food coloring.

PROCEDURE

Step 1: Add about 1 cm of water to the cup.

Step 2: Pour 10 drops of food coloring into the cup or enough to cover the base.

Step 3: Place the piece of celery stalk into the cup of food coloring so that it is resting on its cut surface.

Step 5: Allow the celery to stand undisturbed for 10-15 minutes.

Step 6: After 10-15 minutes, ask the students to comment on what they observed. Record the observations.

Step 7: Reiterate the importance of the nutrients being brought up into the plant and conclude the activity.

NOTE: Water, and the nutrients dissolved in it, are carried upwards in a plant in tiny tubes called XYLEM VESSELS. As water evaporates from the surface of leaves (transpiration) water molecules move to the lower concentration left as the water molecules become a vapor and leave the leaf's surface. As water molecules are attracted to each other (cohesion), when one water molecule leaves it "pulls" the

one beside it along. Since the water molecules are also attracted to the walls of the thin xylem vessels (adhesion), the water can move "upwards" in the vessels, defying gravity!

MAJOR CONCEPTS

Water and nutrients are moved throughout plants by both passive and active transport.

The Transpiration Cohesion Theory explains how water (and the nutrients contained in the water) are moved upward in plant, against gravity, without using ANY energy.

Xylem is the plant tissue which forms hollow tubes that transport water. This is where you can see the food colouring. Plants contain many xylem vessels stretching from the roots to the leaves.

OUR MISSION

Educating Canadians about the sustainable use of nutrients to increase the health and quality of our soil, improve production of nutritious food, and preserve green spaces.

Nutrients for Life Foundation Canada is a non-profit organization that provides information and resources to educators and individuals like you, to help inform the public about the vital role that plant nutrients play in feeding the world. The information we have compiled is science-based and user-friendly. It has been successfully implemented by educators across the country. Through a grassroots

effort, we can spread the word about soil health to students of all ages and to adult organizations that are always looking for programs. Our story is not only important, but it is interesting and serves a vital role in educating consumers and decision-makers in the future.

This lesson is found in NFL's resource, ***Nourishing the Planet in the 21st Century***.

All of our resources are free to teachers across Canada.