

## SOIL PH & PLANTS

### Basic description:

Students investigate the pH of the soil in which different plants grow.

### Source:

Adapted from Botany Projects for Young Scientists by Maurice Blefield, Franklin Watts, 1992.

### Curriculum connections:

Plants: Anatomy, Growth, and Functions

#### Overall Expectations

- Describe the major processes and mechanisms by which plants grow, develop, and supply various products, including energy and nutrition, needed by other organisms.

#### Specific Expectations

Understanding Basic Concepts

- Design and carry out an experiment to determine the factors that affect the growth of a population of plants, identifying and controlling major variables (e.g., examine the effect on plant growth of the quantity of nutrients, or the quantity and quality of light, or temperature, or salinity).

**Preparation time:** 30 minutes to several days

**Duration:** 30 minutes

### Materials:

- Trowel
- Small plastic bags or containers
- Masking tape
- Markers
- Blue and red litmus paper
- Hydrion paper
- Petri dishes (or other small dishes)
- Eye droppers
- Teaspoons

### Preparation:

1. For this experiment, you will need a number of soil samples collected from locations in which different plant species are growing. For example, you may collect soil samples from under a pine tree, a maple tree, a spruce tree, a tomato plant, a radish, an azalea bush, clover, or goldenrod. When collecting your samples, you will want to ensure that soils collected from under a wide variety of plants species are represented.
2. You may collect these soil samples on your own ahead of time or you may choose to take your students on a soil gathering expedition around the school (this could be

incorporated into a plant identification hike). You may also choose to assign this as a homework project, requesting that students bring in soil samples from home (you will want to encourage them to only gather soil from under plants that they can positively identify).

3. To collect your soil samples, use a trowel to dig down 10-15 cm into the soil (harming the plant as little as possible in the process). Place a soil sample into a small plastic bag or container. Label the container with the name of the plant using masking tape and a marker. Fill in the hole you have made as best you can.

### **Procedure:**

This lesson works best as a small group activity.

1. Provide each group with one soil sample, a couple pieces of red and blue litmus paper, an eyedropper and two petri dishes.
2. Review with your students what litmus paper is for and how to read the results from this pH indicator.
3. Instruct the students to place a piece of blue litmus paper in one petri dish and a piece of red litmus paper in the other petri dish. The students should then place approximately a  $\frac{1}{2}$  teaspoon of their soil sample on top of each strip. Using the eyedropper, the students should then moisten the soil until the strips of litmus paper become wet. Finally, instruct the students to brush the soil away. Is their soil acidic or basic?
4. Have your students construct a table in their notebooks consisting of two columns titled Acidic Soil and Alkaline Soil. In the appropriate column, the students should record the name of the plant species under which their soil was found.
5. Instruct each student or group to display their soil sample (with the plant species name clearly visible) and the results of the litmus paper tests in their work area. Allow the students to circulate throughout the room, recording the findings for each soil sample.

### **Questions:**

1. Based on the soil samples used, do more plant species prefer to grow in acidic soils or alkaline soils?
2. What types of plants grow in acidic soils? Do not list all of the plant species. Instead, try to organize them into general classifications (e.g. deciduous/coniferous trees, fruit trees, herbaceous plants, wildflowers, fruit bearing plants).
3. What types of plants grow in alkaline soils? Again, try to develop categories.
4. Using the information gathered, do you think you can now predict whether a soil will be acidic or alkaline by looking at the types of plants growing in the area? Why or why not?

### **Extensions:**

1. Use Hydriion paper to determine the actual pH of the soils used in the previous activity. Record the pH of each soil in a table divided into three columns and based on the following pH distributions: pH 4-5, pH 6-7, and pH 8-9.
2. Design and conduct an experiment to test the growth of a variety of plant species in different soil pH.
3. Design and conduct an experiment to test the effect of soil nutrients on plant growth.

## Resources:

- Science Is... by Susan V. Bosak, Scholastic Canada Ltd. and The Communication Project, 2000.
- Experiments with Plants: Projects for Home, Garden, and Classroom by Joel Beller, Arco Publishing, Inc., 1985.
- Plant Biology Science Projects by David R. Hershey, John Wiley & Sons, Inc., 1995.
- Botany: 49 Science Fair Projects by Robert L. Bonnet and G. Daniel Keen, Tab Books Inc., 1989.
- Botany Projects for Young Scientists by Maurice Blefield, Franklin Watts, 1992.

