Science

pH Poinsettia

Grade Level
4-12
*See note in Summary

Length of Lesson
1-2 class periods

Objective
By the end of this lesson, students will have a better understanding of the pH scale and acidic and basic solutions.

Materials Needed
- Live poinsettia plant
- Water
- Heat source
- Coffee filter
- Medium heat-safe bowl
- Small bowls or test tubes
- Scissors
- Options for solutions (variables):
  - Milk
  - Corn starch
  - Baking soda
  - Vinegar
  - Lemon juice
  - Corn starch
  - Dish soap

Standards
NGSS
2-PS1-1; 5-PS1; MS-PS1

Lesson adapted from Hamilton-Jefferson County Ag in the Classroom.

Lesson Summary
This lesson is a fun experiment that challenges students to think more deeply about acidic and basic solutions. Students will use a natural resource — a poinsettia — as an indicator to test the pH of various products that can be found around the house.

*Grade level: This activity requires boiling water. For lower grades or limited heating materials, it is best to boil the poinsettia bracts ahead of time or even as a demonstration. Once the coffee filters are completely dried and cut into strips, students can then work in groups to test their variables and carry out the rest of the experiment.

Suggested Sequence of Events:
1. Set Up: For younger grades or and/or shorter class times, mix the corn starch, baking soda, and dish soap with water in separate cups so that they are ready to be tested as a liquid solution.
2. Complete the activity following the procedures:
   - Pull off several bracts (red leaves) from your poinsettia plant, cut them into smaller pieces, and then place them in your medium heat-safe bowl.
   - Pour water over the pieces of bracts so that the bracts are completely submerged and there is a little water above.
   - Bring your bract-filled water to a boil with a heat source. To save time, heat for three minutes on high in a microwave.
   - Let them sit in the hot water for a few minutes. Your water should be a purplish color.
   - Place a few coffee filters in the container until they are saturated with the purple water. Set them aside and let them dry completely; they will be a light pink color.
   - Cut the coffee filters into strips.
   - Have students get into groups and set up the experiment. Using the small bowls or test tubes, prepare the solutions and label for identification. Pass out the coffee filter strips.
   - Dip the strips into the solutions (One strip per solution).
   - Compare the color on the strip to the pH scale and record results.
4. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Background Information:
The pH scale is used to indicate the concentration of hydrogen ions in a solution. The pH scale ranges from 0 to 10 where a pH less than 7 indicates an acid, a pH greater than 7 are basic, and a pH of 7 is neutral (temperature also plays a role in neutral pH values). Using a color-changing indicator is one way scientists study the pH of various solutions. The chemicals of an indicator will change color as a reaction to the acid or base of a solution. Each pH value is observed by a number and a color on a pH scale.

A poinsettia is a natural color-changing indicator! This is because the red bracts of the poinsettia contain phytochemical pigments called Anthocyanine. Anthocyanine are the chemical pigments that give food plants their blue, purple, red, and black colors!

Extension Ideas:

- Take the experiment to the next level and turn this into a scientific inquiry! Use our "Scientific Inquiry Student Worksheet" and have students choose their own variables to test.
- Compare the poinsettia indicator strips with other indicator strips and other tools scientists use for testing pH.
- Have students research the classification of soil pH ranges and then describe the pH of the soil in your county and in the state of Illinois. Observe the soil pH around the world and compare that to the type of crop and livestock raised.
    - Use this website to find a survey map and resources from the USDA Natural Resources Conservation Service. The information can be found at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
    - Have students collect soil samples from various places around the county and test their pH. Compare the results and reflect. What would cause some soils be more acidic and others be more basic? Why would soil pH be a concern for a farmer? Why is the pH of water a concern for farmers (and humans) around the world?
    - Have students read this USDA Natural Resources Conservation Service about soil pH. This can be found at https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052208.pdf
- Research the history of the poinsettia plant.
- Watch a video with information about a poinsettia farm. Have students write about what they learned from the video.
- Have students research and/or test what other agricultural products are acids and bases.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!