Iowa Agriculture Literacy Foundation
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Topsy-turvy Soybeans

Target Grade Level / Age Range

3rd through 5th grade

Time:

Twenty minutes with observations for two weeks.

Purpose:

Students will observe how plants respond to gravity by germinating soybeans in a CD case and rotating the case as they grow.

Materials:

- 4 soybeans
- 1 clear plastic CD case (must be thick, not the newer thin style)
- Paper towel
- Permanent marker
- Large binder clip

Suggested Companion Resources

- The Bean Team DVD series, United Soybean Board
- www.podtoplate.org

Vocabulary

- **Germination** - The process of a plant emerging from a seed and beginning to grow.
- **Geotropism** - The growth of a plant in response to the force of gravity.

Background – Agricultural Connections

You might not know it, but plants are able to sense their environment and actually respond appropriately. One of the key parameters that every plant must respond to is the direction of gravity:

stems go up (opposite to the pull of gravity) and roots go down (in the same direction as the force of gravity).

By sensing the gravity, plants can turn sideways, upside down, etc. Scientists first theorized that the plant could tell by the warmth of the plant soil but now we know that they sense gravity and automatically know where down is and grow upwards. This is a crucial skill for the plant because they need to grow upwards and get their leaves out of the soil so they can reach the sunlight and grow. Even though it seems easy to understand that plants sense gravity, the actual mechanisms inside the plant roots are quite complicated. Statocytes are a kind of cell that surrounds the rootlet tips. Inside those Statocytes, the statoliths act as a motion sensor. Movements of these small bodies allow the roots to understand the direction of gravity.

Procedures

1. Cut the paper towel or blotting paper so it fits inside the CD case.
2. Moisten the paper towel and lay it in the case.
3. Evenly place four soybeans on the paper towel. Orient the soybeans in at least two different directions (note the direction of bean's hilum).
4. Close the CD case so that the beans are held snugly. Tape the case shut.
5. Using a marker, number the soybeans 1,2,3,4 on the outside of the case.
6. Set the CD case in an upright position. Attach a binder clip to the bottom to help keep the case upright.
7. Keep the paper towel moist. As the seeds begin to sprout, note the direction in which the roots and stems are growing. Does the direction the seed is turned affect the direction of growth?
8. Two days after the seeds have begun to grow, rotate the CD case 90° on its side. Continue rotating the case every two days. Did rotating the case effect the growth?

Did you know? (Ag facts)

- The soybean or bean is a species of legume native to East Asia, widely grown for its edible bean which has numerous uses.
- Soybeans are used to feed livestock, make biodiesel, and processed into many food and household products.
- Iowa is the top soybean producing state in the country.

Sources/Credits

Original activity from Montana Ag in the Classroom.

Science Content Standards

- Iowa Core Science:
    - Understand and apply knowledge of organisms and their environment. (S.3-5.LS.1)
    - Identify and generate questions that can be answered through scientific investigations. (S.3-5.SI.1)