

# What's Up?

## Discovering Gravitropism

*A lesson from the New Jersey Agricultural Society  
Learning Through Gardening Program*

### Overview:

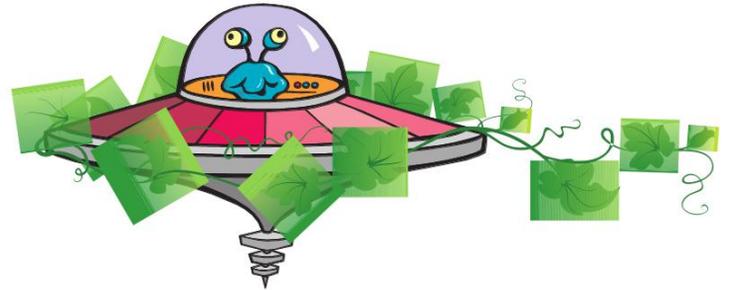
Students will conduct an experiment with pumpkin seeds to determine if the direction of root growth remains constant regardless of the position in which the seed is planted.

### Grades: 2-5

### Background Information:

Gravity is a strong force that exerts its influence on all things on Earth. Plants contain certain growth-controlling substances that are sensitive to gravity. Plants respond to the pull of gravity by orienting shoot growth up and root growth down. This is called gravitropism.

Materials: Scientific Investigation worksheet  
Journal  
8 pumpkin seeds per team  
One clear CD case per team  
Pieces of paper towels  
Plastic zipper-seal bag for each CD



### Procedure:

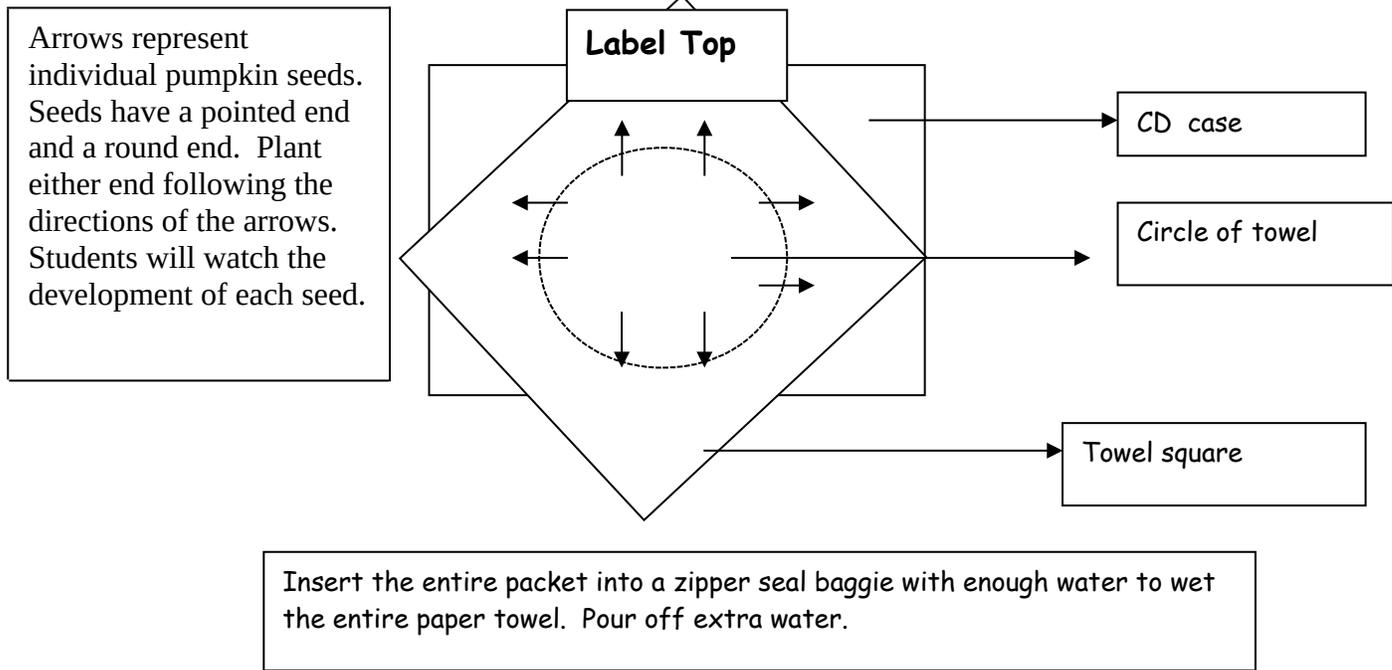
Engage student interest by showing them several different seeds and asking if anyone can tell which is the top of the seed and which is the bottom of the seed. When a farmer or gardener plants a seed, how does he or she know which way to plant it? Accept ideas.

Explain to students that they will be planting pumpkin seeds in a variety of directions to determine whether or not the stems always grow upwards and the roots always grow downwards. Students should record their problem and hypothesis on their *Scientific Investigation* worksheet.

In teams, students set up an experiment to determine if seeds know “up from down.” Place a square paper towel on a diagonal in the CD case as shown in the illustration with the corners hanging over the edges.

Place a circle of paper towel in the center of the CD case. Students then place eight pumpkin seeds in the case so that two seeds point upward, two point downward, two point to the right, and two point to the left. Mark one side of the case TOP.

Place the case in the plastic zipper-seal bag. Pour in about one-half inch of water. Be **sure the TOP of the case is toward the top of the bag. Seal the bag.**



Ask students to observe and record their seeds' germination and root growth and direction. (In all cases the shoot will grow up and the root will grow down.) Teams can compare their results.

*Optional:* When both roots and shoots are one-half to three-quarters inch long, students can turn their CD cases one-quarter turn to the right. Wait three to four days and have students again turn their seed display again. Record observations and drawings on the journal pages. What will happen if the case is turned again?

### Evaluation:

Students complete the materials and procedures sections of their Scientific Investigation worksheet.

Students complete their journals during investigation, recording their seed manipulations and resulting observations.

Students explain what caused the roots and shoots to change direction during the experiment.

### Extensions:

The experiment can be conducted with another type of seed to see if the same results occur.

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## Scientific Investigation Worksheet

**Problem** (*What question do you want to answer?*)

**Hypothesis** (*What do you think will happen and why?*)



**Materials** (*What do you need to do your experiment?*)

**Procedures** (*What steps must you follow to do the experiment?*)

**Observations** (*What do you see happen during the experiment?*)

**Conclusion** (*What did you learn/discover from the experiment?*)