

## How Do Plants Make Food



**LEVEL:** Grades 4-6

**SUBJECTS:** Science, Language Arts

**AZ ACADEMIC STANDARDS:** R-F3, R-E2, W-F1, W-F4, W-F5, W-E5, SC04-S4C1, SC04-S4C3, SC04-S4C4, SC06-S4C3, SC06-S4C1, SC05-S4C1,

### **MATERIALS**

1-2 vegetable plants (big enough for each student to have 1-2 leaves each), aluminum foil, scissors, paperclip (small), black marker

### **VOCABULARY**

chlorophyll, chloroplast, photosynthesis, stomata

### **RELATED LESSONS**

If it Smells Good, is Edible and Attracts Wildlife, Then it's a Practical Garden!  
Where Do They Go?  
Don't Wait, Just Propagate!  
Let's Make Stew  
Survival of the Fittest  
Getting to the Root of the Matter  
This Can't be a Plant  
Soggy Seeds  
Plant Seedling  
Plants, Plants and More Plants

### **SUPPORTING INFORMATION**

Green plants are the only organisms in the world that manufacture their own food. This process is called photosynthesis. It begins when sunlight (artificial light can power this too) strikes the plant's leaves. Inside the plant cell are parts called chloroplasts which contain a green pigment called chlorophyll. Chlorophyll is

what gives the leaf its green color. Carbon dioxide enters the leaf through holes called stomata and combines with the stored energy in the chloroplasts through a chemical reaction to produce a simple sugar. The sugar is then transported by the plant for energy; some is stored as starch; and some is built into a more complex substance, like plant tissue. Along with carbon dioxide, plants also need water, which is gathered by the plant's roots, to make food through the process of photosynthesis. The stomata allows oxygen to be released through this process as well. This oxygen is an important exchange for all living things. Animals and humans inhale oxygen and exhale carbon dioxide. Plants take in the carbon dioxide and give off the oxygen needed to breathe. As well as an exchange of vital gasses, plants often produce more food than they need. We can obtain this energy by eating the plant itself or products of it like carrots, rice, or potatoes. The first step in the food chain is photosynthesis which connects all living things.

Definitions:

chlorophyll: a green substance which gives leaves their color.

Chlorophyll absorbs energy from sunlight which a plant uses to make food.

chloroplast: a plastid that contains chlorophyll and is the site where photosynthesis and starch formation occur.

### **BRIEF DESCRIPTION**

The process by which plants make food is called photosynthesis. This process begins with sunlight, and when this sunlight is inhibited, food production for plants also stops.

### **OBJECTIVES**

1. Students will explain the process of photosynthesis using the correct vocabulary.
2. Students will conduct an experiment limiting sunlight to a plant leaf.
3. Students will make observations and come to a conclusion about sunlight and a plant's ability to make food.

### **ESTIMATED TEACHING TIME**

5-7 days

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photosynthesis: the formation of carbohydrates in the chlorophyll containing tissues of plants exposed to light.  
stomata: a very small hole in the surface of a leaf. Oxygen and carbon dioxide from the air enter and leave through the stomata.

### GETTING STARTED

Make sure you have a large enough vegetable plant, or maybe 2, for every student to have 1-2 leaves.

### PROCEDURES

1. Brainstorm with students how they think plants get their food and energy (accept all answers).
2. Discuss the process of photosynthesis and its basic definition.
3. Ask students if they know why plant's leaves are green (accept all answers).
4. Explain to students that the green leaves come from a green pigment called chlorophyll. This chlorophyll absorbs energy from sunlight which a plant uses to make food.
5. Explain to students that they will test the effects on a plant leaf when sunlight is limited or withheld.
6. Pass out a piece of aluminum foil to each student. They will need to cut out some geometrical shape like a circle, square, or triangle (one for each leaf they will have on the plant). Make sure the shapes are big enough to make a patch that will cover nearly half of the plant leaf. When the foil is cut out, have them write their name on it so that their leaf can be identified.
7. Have students then paperclip their piece(s) of aluminum foil to a leaf on the plant. Place the plant near a south, west, or east window where it will get plenty of sunlight. Have students write down a prediction about how

- the covered part of the leaf will or will not be affected.
8. Have students keep a log for the next 5-7 days about the weather each day and the amount of sunlight the plant receives.
  9. After 5-7 days, remove the shapes from the leaves and observe the changes where the shape was (it should be a lighter green color). Have students log their observations.
  10. Have students compare the areas on the leaf that were covered to the other parts of the leaf and log their observations. Ask them to state whether their prediction was accurate or not.

### EVALUATION OPTIONS

1. Students can write a clear and concise explanation about the process of photosynthesis.
2. Students can write up a summary of experimental outcomes including: What has happened to the leaves? Describe the effects that the lack of sunshine has on leaves. What has or has not happened in different parts of the leaf? Why?
3. Students can create a billboard display explaining their experiment including: the steps, their predictions, observations, and outcomes. Pictures of the leaves or the actual samples can be added as well.
4. Have students answer: Where have you seen effects like these in nature? When would you expect to find fewer plants outside because of lack of sunlight?

### EXTENSIONS AND VARIATIONS

1. Have students design a way that they can make grass grow faster. Mark off two 10 cm x 10 cm boxes of grass and vary the amount of light each square gets. How did the light affect the grass?

What other changes could you make that would help the grass grow faster?

2. Take a trip to a local greenhouse to observe how they raise plants. Find out how they use light, water or other elements to increase growth and productivity.
3. Have students discover if plants need soil for photosynthesis. Try growing a sweet potato just in water. Put the bottom third of the potato in a glass or jar of water. If you need help keeping the rest of the potato out of the water, you may want to insert toothpicks in the potato so that they rest on the rim of the glass. Add water every two to three days to keep the water level the same. Make sure the potato receives a lot of light, and watch it closely. Do roots start to grow in the water? Will the potato be able to sprout leaves or produce potatoes?

### RESOURCES

1. Bonnet, Robert L. & Keen, Daniel G. *Botany: 49 Science Fair Projects*. Blue Ridge Summit, PA, Tab Books, 1989.
2. "How Green Plants Make and Use Food." Minneapolis, MN: University of Minnesota Films, 1984.
3. Education/Research Systems, Inc. *Project Learning Tree: Supplementary Activity Guide for Grades K-6*. The American Forest Council, Washington, DC, 1988

### CREDITS

1. Newton's Apple. [Http://www.pbs.org/ktca/newtons/9/phytosy.html](http://www.pbs.org/ktca/newtons/9/phytosy.html)
  2. Bowser, Karen. [www.umanitoba.ca/facilities/education/grassroots/bowser/discussion.html](http://www.umanitoba.ca/facilities/education/grassroots/bowser/discussion.html)
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**EDUCATORS' NOTES**

**CURRICULUM DESIGN**

Annette Cribbs and  
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*This Arizona Grown Specialty Crop  
Lesson Plan was paid for by a  
grant from the Arizona Department  
of Agriculture's Office of  
Marketing and Outreach.*

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