AT HOME SCIENCE!

CONSUMING PRODUCERS: ALL ABOUT PITCHER PLANTS

ATLANTA BOTANICAL GARDEN

This science experiment can be done using simple household items. Students will create a passive insect trap inspired by pitcher plant adaptations.

What You'll Need:

- Scissors
- Tape
- Water Bottle/soda bottle
- Apple Cider Vinegar
- Dish soap
- Water
- Sharpies or paint (optional)

Background Information:

Georgia is home to many types of carnivorous plants. These plants have adapted special features to help them survive in nutrient poor bog, swamp, and marsh habitats throughout the state. The soils in these habitats can get very wet but lack essential supplements like nitrogen and phosphorus, that plants need to survive. Carnivorous plants get their nutrients by attracting and trapping bugs that their plant systems break down and absorb.

One type of carnivorous plant found in Georgia is called the pitcher plant. There are around seven species of pitcher plants in the state. All are a part of the genus Sarracenia, and all are on Georgia's protected plant list. Plants in this genus have leaves in the shape of funnels or pitchers that have evolved to catch bugs. These leaves act as a passive trap, meaning they do not move at all to attract or trap prey. Pitcher plants have bright red, white or yellow-green leaves; sweet scents; and tasty nectar to entice insects to come to the plant. Once an insect has found its way into the pitcher-shaped leaf, slippery sides and downward pointing hairs prevent it from escaping. Some pitcher plants have leaves filled with water and bacteria that help break down the bug while others secrete enzymes from their leaves that liquify the bug. Bug nutrients are absorbed through the leaves of the pitchers and distributed throughout the plant.

Making a Passive Trap for Insects

1. Clean out an empty water bottle or soda bottle using soap and water and let dry. Have an adult help you cut off the top of the bottle a couple of inches below the neck.
2. Make a solution of one part water to one part apple cider vinegar. Add a drop of dish soap.
3. Pour in the solution into the bottle. The bottle should be less than halfway full to drown the flying insects.
4. Invert the cut top of the bottle and attach it to the solution filled base with the neck facing down.
5. Tape the top and bottom of the bottle together to close off gaps and keep it secure.
6. Place your trap in the kitchen to attract and trap fruit flies or outside to attract other insects.
7. Check your trap everyday and count the number of insects caught in your trap. After about a week of use, throw away your trap and make another.

Diving Deeper

More Adaptations! Pitcher plants have many adaptations that help them attract and trap bugs more efficiently. These features include bright colors, appealing scents, and hairs that prevent bugs from escaping. Choose one adaptation to replicate in your trap to see if it increases the number of insects you catch. For example, you may choose a "nectar" other than apple cider vinegar or color parts of your trap a different color or invent another modification that you think might help. What traps the most bugs? Do real pitcher plants have similar adaptations to the ones you chose?

Insect Population Count: Many scientists use passive pitfall traps to study the types of animals present in an ecosystem. You can do the same to discover what invertebrates are in your area. Dig a hole in the ground outside and place your water bottle trap inside so that the top of the bottle is level with the surrounding dirt. Leave overnight and see what insects and other invertebrates are trapped in the morning. Prefer a trap and release method over killing invertebrates with apple cider vinegar? Instead of a liquid attractant at the bottom of your bottle use fruit.

Comparing Georgia Habitats: Pitcher plants grow in marsh, swamp, and bog habitats of our state. What are characteristics of these types of habitats? What other Georgia plants and animals might you find in this type of habitat? Draw a picture of one of these wetland habitats and include the wildlife adapted to live there.

Take a walk outside and notice outdoor habitats that you live near. What plants and animals do you notice around you. Draw a picture of this outdoor habitat and the wildlife that you find.

Compare the two habitats that you've drawn. What are the differences? Similarities? Would plants and animals that live in wetland areas be able to survive in the habitats around your home? Why or why not?

Same but Different: Convergent Evolution in Pitcher Plants

Find images of the following plant genera online or in books: *Sarracenia, Nepenthes, Cephalotus*. How are they similar? How are they different? Do they look related?

Sarracenia pitcher plants are from North America, while Nepenthes pitcher plants are generally from Southeast Asia, and the Cephalotus pitcher plant originated in Australia. Scientists have evidence that the North American Sarracenia plants are actually more closely related to blueberries and kiwis than either of the other two types of pitcher plants! Each of these different type of plant developed similar mechanisms for surviving in soggy, nutrient poor soil through the process of convergent evolution. Can you think of other organisms that have similar features but are not related?

Additional Resources

How Carnivorous Plants avoid eating their pollinating insect friends

Planet Earth: Nepenthes

Private Life of Plants: Venus Flytrap and Pitcher Plant

4 DEADLY Carnivorous Plants

An inside look at carnivorous plants

Virtual Learning Journey Regions of Georgia

GPB Education | Okefenokee Swamp Live

Standards Covered in this Lesson:

S1L1. Obtain, evaluate, and communicate information about the basic needs of plants and animals.

S3L1. Obtain, evaluate, and communicate information about the similarities and differences between plants, animals, and habitats found within geographic regions (Blue Ridge Mountains, Piedmont, Coastal Plains, Valley and Ridge, and Appalachian Plateau) of Georgia.

a. Ask questions to differentiate between plants, animals, and habitats found within Georgia's geographic regions.

b. Construct an explanation of how external features and adaptations (camouflage, hibernation, migration, mimicry)

c. Use evidence to construct an explanation of why some organisms can thrive in one habitat and not in another.

S5L1. Obtain, evaluate, and communicate information to group organisms using scientific classification procedures.

S7L1. Obtain, evaluate, and communicate information to investigate the diversity of living organisms and how they can be compared scientifically.

S7L4. Obtain, evaluate, and communicate information to examine the interdependence of organisms with one another and their environments.

d. Ask questions to gather and synthesize information from multiple sources to differentiate between Earth's major terrestrial biomes (i.e., tropical rain forest, savanna, temperate forest, desert, grassland, taiga, and tundra) and aquatic ecosystems (i.e., freshwater, estuaries, and marine). (Clarification statement: Emphasis is on the factors that influence patterns across biomes such as the climate, availability of food and water, and location.)

S7L5. Obtain, evaluate, and communicate information from multiple sources to explain the theory of evolution of living organisms through inherited characteristics.