Crickets on the Hearth

Objective

Students will learn about biomass, biofuels, and biogas.

Background

Farmers pay attention to the weather for many reasons. They want to know when it's going to rain so they will know when to irrigate. They want to know when it's going to freeze so they can protect crops that don't tolerate the cold. They also want to know how to use the weather to control the pests that might damage their crops.

Since some insect problems could get worse at predictable times of the year, many growers time their planting to protect their crops from those high risk periods. The Hessian fly, for example, is a minor pest for some Oklahoma wheat growers. Prevention is the only way to control it, so wheat growers are advised to put off planting until after a "safe-seeding" or "fly- free" day set by the Oklahoma Agricultural Experiment Station. To avoid corn earworm damage, some corn growers may plant varieties of sweet corn that mature early, before the corn earworm moths begin laying eggs. Since grasshoppers lay their eggs in the soil, and the eggs cannot survive freezing temperatures, growers may turn the soil over in the fall to expose the eggs to the cold.

Crickets are not considered a serious threat to any food crops, but during certain times of year they become accidental household invaders. They spend most of their lives outdoors, where they feed, grow, develop and reproduce. Only during a limited portion of their life cycle do they wander indoors by mistake and create an annoyance. Chirping is annoyance enough for some homeowners, but crickets may also destroy houseplants or eat holes in paper, rubber and garments made of cotton, linen, wool or fur.

Male crickets chirp by rubbing a scraper located on one forewing, held at a 45 degree angle, along a row of about 50 to 250 teeth on the opposite forewing. This process is called stridulation. The frequency of the chirps depends on the number of teeth struck per second and varies from 1,500 cycles per second in the largest cricket species to nearly 10,000 cycles per second in the smallest.

In some cricket species there is a direct relationship between the rate of chirps and temperature. Crickets are cold blooded and take on the temperature of their surroundings. As the temperature rises, it is easier for the cricket to reach a certain threshold energy and chemical reactions, like those needed for muscle contractions to produce a chirping sound, can happen quicker. As temperatures fall, the chirping is slower. According to the Farmers Almanac, farmers have used crickets chirping to determine the temperature since the late 1800's. When the temperature is between 55 and 100 degrees Fahrenheit, you can determine the temperature where a cricket is sitting. The Farmers Almanac equation requires you to count the number of chirps in a 14-second interval and add 40.

Oklahoma Academic Standards

High School
Life Science 1-3
Pre Algebra PA.A.1.1,2; 2.1,2

Crickets play a large role in myth and superstition. Their presence is equated with good fortune and intelligence. Some cultures believe harming a cricket can cause misfortune. In East Asia male crickets are caged for their songs, and cricket fighting has been a favorite sport in China for hundreds of years. Tokyo, Japan, is reported to be one of the most crowded cities in the world with little space for a pet. Throughout Japan there are shops that sell crickets, various caged housing, food and informational pamphlets about raising crickets. Crickets are not popular pets in the United States, but some farmers have begun raising crickets as a source of live food for pet lizards and other reptiles and amphibians. Live crickets are also in demand as fish bait.

Activities

1. Students may work individually or in small groups.

—Students will collect live crickets and bring them to class. You may also purchase live crickets from a pet store that sells them as food for pets.

—Students will share what they know about crickets. Where did they find the crickets they brought to class? What do crickets need to survive?

2. Read and discuss background information and vocabulary.

—Ask students what effect the cold has on crickets. Students will be conducting an investigation to answer that question.

—Discuss the scientific method and explain that the scientific method usually involves two tests, one in which all conditions are normal (the control) and another in which one and only one part is different from the normal (the experimental). The results of the experimental test are compared with the results of the control test to answer a specific question.

—Each student will divide his or her crickets between the two water bottles and cover them with the pantyhose. Students should write their names on the bottles and label one bottle "control" and one bottle "experimental."

—Cut two or three apples into small slices, and provide each student or group with a slice for each bottle.

—Students will use a beam balance to weigh the apple slices before placing them in the bottle. Weights should be recorded on the chart provided.

—Students will place a damp paper towel in each bottle.

—Provide thermometers for students to measure the temperature inside each bottle. Students will record the temperature on the student worksheet.

—Students will place the bottles marked "experimental" in a refrigerator or a designated place outdoors, if the weather has turned cold.

—For the next three days, students will check their crickets and record observations on the student worksheet. Students will count the number of chirps in a 14 second interval and add 40 to compare to the actual temperature. They will compare this with the actual measured temperature to determine if crickets can help "tell the temperature."

—Students may write additional observations on the backs of the worksheets, e.g., the positions of the crickets, activity levels, color changes, odors, growth, food consumption, etc.

Vocabulary

accidental—unintentional, unplanned

annoyance—irritation, a bother

corn earworm—a large striped American moth larva that feeds destructively on corn, tomatoes, cotton bolls, and many other plants

equated—considered as equivalent to something

forewing—either of the pair of front wings on a four-winged insect

Hessian fly—small fly destructive to crops, especially wheat, barley and rye

invader—attacker; trespasser

myth—a legend, fable, parable, or fairy tale

predictable—obvious, expected, unsurprising

superstition—a belief or practice generally regarded as irrational

Resources Needed

(for each student or group)

live crickets
2 plastic bottles w/tops cut off
1 pair knee high panty hose
apple slices
damp paper towels
thermometer
stop watch
marker pen
beam balance or other device for weighing apple slices

—At the end of the fourth day students will use the observations from their worksheet to complete a formal report, using the "Scientific Method" outline provided with the lesson.
—Students will discuss their conclusions as a class.

3. Lead a discussion about possible uses for this kind of information in planning pest control methods in food production.
4. Over the four days students are observing their crickets (Activity 2), read and discuss Charles Dickens' short story, "A Cricket in the Hearth." The story can be found online: http://www.gutenberg.org/files/678/678-h/678-h.htm

—In the story, Mary Peerybingle proclaims, "To have a cricket on the hearth is the luckiest thing in all the world," for Mary the cheerful cricket's song symbolizes her happy home. For Tackleton, the toymaker, the cricket's song is an irritating noise to which he responds by "scrunching 'em" under his heel. Discuss the idea that what is a pest in one situation might not be a pest in another situation. Relate the discussion to the need to consider advantages and disadvantages before killing pests.

5. Students will use online search engines or library references to research integrated pest management and relate this method of pest management to the discussion in Activity 4.
6. Students will write stories or poems with their crickets as the main characters.

Extra Reading

Dickens, Charles and Katherine Kroeber Wiley, *A Christmas Carol, The Chimes, The Cricket on the Hearth,* Barnes & Noble, 2004.

Dorin, Paul, *Crickets on the Moon*, Trafford, 2006. (Young Adult)

Holman, Felice and Robyn Thomas, *The Cricket Winter*, Eerdman's, 2006.

Selden, George, *Cricket in Times Square*, Farrar Straus and Giroux, 1999.

Squire, Ann O., *Crickets and Grasshoppers*, Children's, 2004.

Name: _____

Crickets on the Hearth

According to the Farmers Almanac, farmers have used crickets chirping to determine the temperature since the late 1800's. When the temperature is between 55 and 100 degrees Fahrenheit, you can determine the temperature where a cricket is sitting. The Farmers Almanac equation requires you to count the number of chirps in a 14-second interval and add 40.

$$N_{14} + 40 = T_F$$

N_{14} is the number of chirps in 14 seconds; T_F is the Temperature in Fahrenheit as measured by crickets

Experiment: Each student will divide his or her crickets between the two water bottles, with the tops cut off, and cover them with the pantyhose. Students should write their names on the bottles and label one bottle "control" and one bottle "experimental." Students will place the bottles marked "experimental" in a refrigerator or a designated place outdoors, if the weather has turned cold. To provide food for the crickets, add apple slices to each bottle. Weigh the apples to determine if the temperature also affects the cricket's food consumption.

******Check your crickets each day and use the chart below to record your observations. Use the back to write additional observations.***

	Control Test (normal cricket bottle)	**Experimental Test** (cold cricket bottle)
Day One		
Actual Measured Temperature		
$N_{14} + 40 = T_F$	_____ _____ (# chirps in 14 sec.) + 40 = Temp in F	_____ _____ (# chirps in 14 sec.) + 40 = Temp in F
$N_{14} + 40 = T_F$	_____ + 40 = _____	_____ + 40 = _____
Weight of apple slice		
Day Two		
Actual Measured Temperature		
$N_{14} + 40 = T_F$	_____ + 40 = _____	_____ + 40 = _____
$N_{14} + 40 = T_F$	_____ + 40 = _____	_____ + 40 = _____
Weight of remaining apple		
Day Three		
Actual Measured Temperature		
$N_{14} + 40 = T_F$	_____ + 40 = _____	_____ + 40 = _____
$N_{14} + 40 = T_F$	_____ + 40 = _____	_____ + 40 = _____
Weight of remaining apple		
Day Four		
Actual Measured Temperature		
$N_{14} + 40 = T_F$	_____ + 40 = _____	_____ + 40 = _____
$N_{14} + 40 = T_F$	_____ + 40 = _____	_____ + 40 = _____
Weight of remaining apple		

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