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Meet Kit - Lesson plan relating to Chapters 6-10
Raise Crickets / Create a Cricket Farm

Summary

Soil is basically a structure composed of rocks and minerals that have been broken down to various finely ground particles called sands, silts and clays. These names describe the size of the particles and range from the largest particles of sand to the smallest of clay. These particles provide structure for the soil and are extremely important for plant growth, but a healthy productive soil requires organic matter otherwise known as humus. Without it, plants fail to thrive. Humus helps the soil retain moisture, provide air to the root system and provide nutrients to the plant.

A contributor to the organic matter, humus, content of the soil is the cricket. There are several species of crickets commonly found - including House, Ground, Field, Tree, Camel and Mole Crickets and all function help build soil.

This experiment will allow students to raise crickets and to see firsthand how they live. With careful observation, they will also be able to see them go through all three stages of life, how they reproduce, and to have a better understanding of the basic anatomy of insects in general.

Grade Level: 3 - 6

Duration:

Setup - 1 hour
Daily feeding - 10 minutes
Observation - 15 minutes daily

Personnel:

Teacher or other adult

Costs:

Costs will vary depending on the materials that you select. The process can be made to be very minimal if you select to use recycled materials and provide some of your own labor.

Learning Objectives:

Students will learn how crickets function to break down organic material.

Students will learn how crickets develop and make noise with their wings.

Students will learn about cricket life and characteristics and their importance to soil.

Materials:

- A large plastic storage container - ensure that it is not clear (for breeding)
- A medium plastic sweater box - ensure that it is clear (for mating)
- two pieces of metal mosquito netting 4" x 4"
- duct tape
- A container of water
- cardboard egg cartons
- a peanut butter jar lid
- Clean sand or potting soil
- 2 - 3" or deeper plastic tubs - like a butter tub or a powdered lemonade drink container lid
- coarse sand paper
- Organic matter such as fresh leaves, grass and/or kitchen scraps
- Crickets - You can purchase crickets from a pet store (or a bait store) or you can collect your own. To collect crickets, look in grassed areas - especially those with a poor cover. If you are collecting your own, try to obtain about 30 crickets to begin with.

For Observations:

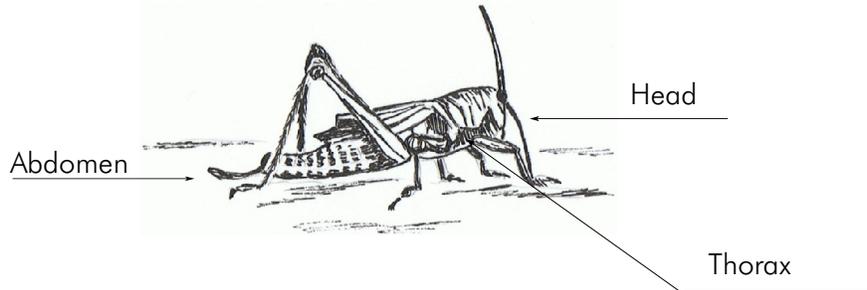
- notebook to record observations
- Dissection dish or cardboard - one per student or study group
- magnifying glasses
- small clear plastic boxes such as a reused food container - one per student or study group

Procedure:

- Place all of the materials required out in one spot so that they can easily be reached as they are needed. Make sure that your containers have been washed thoroughly to ensure that no contaminating residues are left on the boxes.
- Cut a 3.5" x 3.5" square in the top of each of the two plastic boxes, cover each hole with a piece of mosquito netting and duct tape in place
- Create the Breeding Colony -
Cut the egg cartons so that standing they will reach to about 4" from the top of the large plastic box
Roughen the sides (inside and outside) of the two tubs with the sand paper. Place sand / potting soil in one of the tubs and dampen - use the second tub to hold the food
the short lid will be used to provide water - roughen the sides (inside and outside) of the lid with the sand paper
Arrange the box such that some of the egg carton bottoms are vertical and the rest are along the bottom. Place the lid with water and the two tubs in the bottom of the box. Mist or otherwise moisten the egg cartons.
Fill the food tub with the organic matter.
- Place your Breeding Colony in a warm accessible place. The warmer the location the more active the crickets will be. Ideally, crickets should have a space that is between 80 and 86 degrees F. A lamp with a 60 watt light bulb placed near your box should heat it up enough above room temperature to enhance cricket development. Take care to prevent the light bulb from touching the plastic box as it could melt the plastic. Crickets will produce a good deal of noise and do have an odor, so keep this in mind when choosing the location. Do not set your box in a window - temperatures of over 96 will cause overheating and death.
- Open the lid of the box and dump the crickets in.
- Leave undisturbed for 3-4 days other than to add water, food and to mist the sand in the tub.

Observation 1:

- Reach into the box and remove a cricket for each student or student group. Place each cricket into a small clear plastic box - remember that crickets can run, jump and climb.
- Have the students study the cricket. Crickets, like all insects have three main parts: a head, a thorax and an abdomen. They also have two pairs of wings, two sets of walking legs and two longer jumping legs in the rear. Close observation with a magnifying glass will also show a compound and a simple eye behind each antennae. Students should also be able to see spiracles, or small holes used for breathing along the bottom of the abdomen and three cerci, sensory organs at the rear of the abdomen



- Crickets breathe through tiny holes in their abdomen called spiracles (which are usually observed in sets - the cricket should have 7 - 8 sets of spiracles) not through their mouths. Have students hold the cricket in their hand and observe the insect breathing.
- To observe the heartbeat, clip off the wings with a dissection scissor or clipper and pin the cricket to the dissection dish using one pin through the thorax near the head and another near the posterior end of the insect. The heart is just under the skin along the centerline of the back or top of the insect. It is very thin and runs from the tip of the abdomen to the thorax. Use the magnifying glass to observe the heart beat. Count the number of beats per minute.
- Hold the cricket in your hand for several minutes to warm it. Observe the breathing and heart rate again and compare it to the room temperature rate previously observed.
- Note that the cricket will eat just about any kind of organic matter. To gauge of their eating capacity, place a piece of a potato in which you have measured the size and if possible the weight. Measure the potato after a day. How long does it take for the crickets to eat the entire piece? Note that their food is basically the same material that would be found in a compost heap.

Observation 2:

- Crickets go through three stages of development - egg, larvae and adult. After 14-16 days, you should be able to observe all three stages. Three days after set-up lift the sand filled tub out of the plastic box taking care to not release any of the crickets out of the box. You should be able to see eggs in small clusters of 10 - 20 eggs deposited in the sand. Observe the eggs with a magnifying glass and take notes. The eggs will require about 13 days to hatch. Observe the eggs daily and note changes. Replace and mist the sand / egg filled tub after each observation.

- From the beginning of larvae development to the adult stage takes a cricket about six weeks. During that time, crickets will go through eight stages of maturity. At the end of each stage the larvae will molt in order to continue to grow. The old skin is often peeled off whole. Observe that the newly molted larvae are soft and have a milky white color. It takes several hours for the skin to harden and turn brown. Keep note concerning the changes that the larvae make as they mature. The last couple of molt stages can be determined by the presence of short wing pads and a tube-like projection from the rear of the insect called the ovipositor.

Observation 3:

- After the last molt, the cricket is considered an adult. Within 3-4 days it is sexually mature and capable of mating. Females will begin laying eggs after mating at 8-10 days old in groups of 50 - 100 and over a period of two days to two months. They are ready to mate again every 2 - 3 weeks.
- In order to be able to observe mating, isolate several males and several newly emerged females for several days. Bring them together in the medium sized clear plastic box. Place the sand tub or a new sand tub into the box with the mating pairs to be observed. Keep daily records of your observations.
- Once the wings are fully formed, males can use them to produce chirping. They lift their wings and rub one over another. A male will produce a long chirp to attract females from a long distance. You should be able to watch this chirping taking place. As a female approaches, the chirp will become stronger and the intervals between sounds shorter. The dominant males will have the greater and more confident chirp.
- By observing your crickets daily, you should be able to observe crickets mating. As the female approaches the male he begins stroking her with her antennae. She then climbs on his back. If a male fails to attract the female within close proximity, he might resort to butting her with his head. The male delivers his sperm in a package called a spermatophore. This sack will appear at the posterior end of the male after the female mounts him and will be moved by the cerci (the two points on the rear) into place on the female's posterior. She will quickly dismount after this is in position. The female will store the sperm and fertilize each egg individually using the sperm up over a period of two weeks. She use her long ovipositor to insert the eggs into the sand tub in groups of 10 - 20. You should be able to watch her push her ovipositor into the sand and pull it out to deposit eggs in another place.