Soil Decomposers

Goal:
Students will understand the food web of soil decomposers and impacts of the environment on soil decomposers.

Objectives:
- Conduct three experments with earthworms.
- Identify the four categories of soil decomposers.
- Understand the role of soil decomposers as part of the food web.
- Understand the impact of "influencers" on earthworms through experiments.

Grade Level: 6-8; K-4

Subject Areas:
science, biology, math

Materials Needed:
- 50-100 Earthworms (garden, local bait shop or pet store)
- Heating pad
- Stopwatch
- Ice pack
- Soil/sand
- Shoe box top
- Aluminum foil
- Vinegar/lemon juice
- Flashlight or other singular light source

Time to Complete:
45-55 minutes

Background

Healthy soil contains various organisms that decompose plant and animal material into organic matter. These organisms include bacteria, earthworms and fungi. A typical acre of soil contains 10 to 40 pounds of earthworms and 400 to 4,000 pounds of bacteria.

The soil organisms range in size from one-celled organisms to complex nematodes to insects and worms. Each layer of the soil food web is working together to provide healthy soil which in turn assists us to have clean air, clean water, healthier plants and regulated water flows.

The soil food web, as with all food webs, has producers and consumers. Plants use the sun's energy to make their own energy; they are also called producers because they produce energy that is then available for other organisms to eat. The consumers of the organic materials are bacteria, fungi, protozoa, nematodes, arthrodpods, earthworms and more. Each group's decomposers assist in consuming the organic matter and converting it to healthier soil and removing harmful elments from the above ground food web. The cycle continues as the plants need the healthy soil from the soil decomposers to produce more food.

The Soil Primer – available online at http://soils.usda.gov/sqi/concepts/soil_biology/biology.html provides further details on soil decomposers, soil food webs and soil biology.

Preparation

Gather supplies and materials. Ensure that the earthworms are keep in a cool, dark environment prior to the experiments. Do not keep the earthworms for more that 2 days prior and ensure they have a little moisture. Do not let the worms dry out. Handle the worms with care and when all experiments are concluded, place earthworms in a garden.

Procedure

Experiment 1: Light Sensitivity

1. Line one shoebox lid with foil and keep one shoe box lid without.
2. Place earthworm in each of the box tops (ensure the earthworm is still alive by waiting a few moments for movement).
3. Turn on the light and shine it on the shoebox with the foil for 2-4 minutes (use a stop watch).
4. Record observations (did the earthworm react to the light?).
5. Record observations (observe the earthworm that was not exposed to light).
6. Draw conclusions from experiment. Are earthworms light sensitive?
7. Have students compare their observations with each other and write conclusions on blackboard or flip chart.

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Repeat the experiment with students either working in pairs or small groups (depending on the number of shoe box lids and worms available).

Experiment 2: Heat and Cold Sensitivity

1. Turn the heating pad to on (low setting).
2. Place a cold ice pack into a shoe box lid (with a towel under the ice pack).
3. Place one earthworm on the heating pad and one on the ice pack.
4. Record observations for 5-10 minutes.
5. Draw conclusions from the experiment. Are earthworms heat or cold sensitive?
6. Have students compare their observations with each other and write their conclusions on blackboard or flip chart.

Repeat the experiment with students either working in pairs or small groups (depending on the number of shoe box lids and worms available).

Experiment 3: Touch Sensitivity

1. Add soil or sand to one of the two shoebox lids (about ½").
2. Keep the second lid empty (just the cardboard).
3. Place one earthworm on the sand/soil and one in the empty shoebox lid.
4. Record observations for 5-10 minutes.
5. Draw conclusions from the experiment. Are earthworms touch sensitive?
6. Have students compare their observations with each other and write their conclusions on blackboard or flip chart.

Repeat the experiment with students either working in pairs or small groups (depending on the number of shoe box lids and worms available).

Experiment 4: Acid (chemical) Sensitivity

1. Place an earthworm in each empty shoebox lid.
2. Using an eye dropper, drop 1 or 2 drops of lemon juice or vinegar on one of the earthworms.
3. Record observations for 5-10 minutes.
4. Draw conclusions from the experiment. Are earthworms acid (chemical) sensitive?
6. Have students compare their observations with each other and write their conclusions on blackboard or flip chart.

Repeat the experiment with students either working in pairs or small groups (depending on the number of shoe box lids and worms available).

Extension

Lurkers in the Lens

Grades: K-4

TIme: 45 minutes

Materials:

- Hand lenses
- Small garden trowels for digging
- Spoons, cups for collecting creatures
- Paper and pencils

Procedures

1. Gather the students to take them outside in the schoolyard or a local park
2. Provide each student with a hand lens.
3. Have the students practice indoors how to use the lens appropriately to look at common objects – pencils, paper, etc.
4. Using a small organism – like an ant, spider or worm – demonstrate how to handle creatures gently and return them to their homes after observing them. Model good behavior for holding an insect..
5. Take the students outside and ask them to explore the school grounds and to use the hand trowel to over turn a patch of soil or if you have a garden to turn over soil.
6. Have the students find an insect to observe.
7. Have the students observe the insect for a few moments – enough to draw a detailed drawing of what they noticed (color, shape, wings, other features).
8. Encourage them to add notes about where they found the insect and what it does.
9. Afterward, invite them to share what they observed with the group.