



Vermicomposting

Science

Purpose

The class will create a worm bin which will serve as a basis for experiments about ecosystems, life and nutrient cycles, and decomposition.

Time: 1 hour to set up; additional time for observation

Level: Elementary

Materials

- Plastic bin with lid
- Newspaper
- Water
- Soil
- Food wastes
- 1 pound of red wiggler earthworms (There are many mail order sources. Contact your county Extension office or search online for sources of earthworms.)

Background

Students may be familiar with recycling tin cans and plastic bottles so that the materials can be used again and again, but do they also realize that nature has a very efficient recycling program as well? By introducing vermicomposting into your classroom, students can observe how ordinary creatures like worms become super recyclers, turning kitchen scraps into compost that can help living plants grow and thrive.

Earthworms live in soil all over the world. They help change bits of dead plants and animals back into nutrients that plants can use. Students may be interested to learn that worms recycle by eating the dead organic matter and then turning it into castings—also known as worm poop—that are nutrient rich and useful to plants. Worms also help aerate and loosen the soil so that plants' roots can more easily develop underground. For these reasons, worms are an integral part of a healthy ecosystem.

Vermicomposting is a great way for students to observe these worm's effect in a miniature ecosystem. To begin, set up a worm bin according to the included instructions. There are many different types of worms, but the best-suited for indoor vermicomposting are red wigglers, which are readily available for mail order from many websites.

Once the bin is set up, assign one or two students a week to give food scraps to the worms. Worm bins do poorly with food scraps that are fatty or contain meats, but work well with newspaper, vegetables, coffee grounds and even eggshells. Although earthworms eat a lot for their size, they need only a couple of small handfuls of food a week. As the worm population grows, they should be able to eat more food. Make sure the food scraps are buried—this will prevent bad food odors.

Maintaining worm bins is easy, but be sure to keep the following things in mind as you tend to the worms:

- Too much moisture will cause molds and other unwanted pests to grow, which will prevent the worms from doing their job. If condensation is forming inside the bin, simply remove the lid to let the bin air out for a couple of hours and then add more holes for drainage and ventilation.
- The worms will have a hard time surviving if the compost is too dry. The bedding material should be moist to the touch without forming droplets when squeezed. If there is not enough moisture, simply use a spray bottle to add one or two tablespoons of water at a time until the bin is at the right moisture level. If lack of moisture continues to be a problem, consider closing off some ventilation holes with tape.
- If the worms are given too much food, the bin may start to stink as bacteria and other microorganisms break down the food before the worms can. If this becomes a problem, it may be a good idea to remove some of the excess food and monitor how fast the worms are eating the food that is added.
- Typically, room temperature is great for worms, but be cautious that they do not over heat or get too cold, as either situation could stun and possibly kill the worms.

After a few months, the compost can be harvested. Open the bin and shine a bright light onto the soil. The earthworms will migrate to a deeper level away from the light, and the top layer of soil can be scraped away for later use. Continue this process until you get close to the bottom of the bin and mostly earthworms remain. Then add fresh bedding and soil to the bin to give the worms a new home again. The compost that is scraped away makes a wonderful soil amendment for garden and indoor plants.

Activity Procedures

Setting up the Bin

1. Drill small holes (about the width of a toothpick) around the base of the container about 2 inches from the bottom. Space the holes at about one per inch. These holes allow air flow to and from the soil.
2. Next, add bedding to the bottom of the bin. Bedding can be made by shredding newspaper into inch-wide strips. Wet the strips by dipping them into water. Fill about 6 inches of the bottom of the bin with wet newspaper bedding.
3. Sprinkle a 2-inch layer of soil over the bedding and sprinkle it with water to make the soil damp.
4. Bury food scraps under the soil.
5. Now add your earthworms, and they will go to work!

Discussion and Observation

1. Ask students what the word RECYCLING means. Have them call out items they have recycled before. Make a list of those items. Ask the students if the food can be recycled. Tell them to imagine they are in the cafeteria at their school. Have them try to think of ways they can use the leftover food being thrown away to make something else. (This question will probably bring interesting responses.)
2. Ask the group what happens to leaves in the forest during the winter. (They fall to the ground.) Ask them why the leaves that fall from the trees every year don't just pile up higher and higher. (They break down/ decompose and become part of the soil.) Explain that food can be recycled in the same way plants are recycled in the environment. Tell them that they will recycle their leftovers into a special soil that will help give plants the nutrients they need. The secret is earthworms.
3. Show them the earthworms in the bin and allow them to find a worm and look at it closely. Tell the group that these red wiggler earthworms are especially suited for composting food scraps inside an indoor bin.
4. Count how many worms are added to the bin initially. Then, periodically separate the worms from the compost (either by sifting, or if the material can't be sifted, dump the bin onto a tarp outside and have students sort through it) and count them again. Are there more or less worms now? If the population has grown it is because the worms have everything they need to reproduce. If the population has shrunk, it is because the worms don't have the right environment (see background information for help on determining what problems the worms might be having).

Additional Activities

Have your class experiment with measuring the effect of the vermicompost on plant growth. They could use such variables as growing seeds with differing amounts of compost added or adding different amounts of compost to plants growing in the garden. Have them predict which amounts of compost will produce the best results. The students can then use tape measures to record growth and observe the changes in the plants.