SCIENCE FAIR CENTRAL

MAKE. CREATE. EXPLORE.

Working with Worm Waste!

Families will work together to build and setup a vermicomposting bin, where worms will work to break down food waste into "black gold" and "worm tea!"

Background

You might think of worms as slimy and maybe even a little creepy, but worms are actually an essential part of a healthy ecosystem! While they are a vital food source for other animals, it's what they do to soil that makes worms so important for the growth of plants, and ultimately to us! One of the jobs of a worm is to break down decaying organic matter and turn the soil to help cycle nutrients back to the roots of plants. They also leave behind a rich fertilizer called **castings** (which is actually worm poop) that is known as "black gold!"

People harvest these castings and a liquid fertilizer called "worm tea" from special composting bins that are made to house worms. The worms break down waste in the bins and create a nutrient-rich compost that can be used on gardens and house plants. The practice of composting with worms is called **vermiculture** and is an easy and fun way to get rid of food waste while creating free and organic fertilizer!

Plan

In this activity, your family will use household materials to create a "worm bin" that help get rid of food waste and use the power of worms to produce compost that you can use to enhance the growth of your garden or houseplants! You may not know it, but worms are known as ecosystem engineers because of the important role they play in the creation of nutrient-rich soil that supports plant and animal life in ecosystems.

Design

What are the materials you might need to get started?

Create!

Before you begin building your "worm bin" decide which member of the family will have each of the following jobs:

- **The Driller**—this group member's (preferably an older child or adult) tool will be a drill and a 1 ½" hole saw bit. They will be in charge of drilling holes in the lid of the plastic to provide ventilation for the worm bin.
- **The Cutter**—this group member's (preferably an older child or adult) tools include either a utility knife or heavy scissors
- **The Sander**—this group member's tools include a sanding sponge or sandpaper. They will sand down the surface of the plastic bin in preparation for glue!
- **The Worm Habitat Design Specialist**—this group member will prepare the habitat for the worms, adding a mixture of coir grow media, newspaper strips, paper towels (or cardboard), water, and food waste in layers to create the perfect worm habitat inside the bin.

Steps for constructing your VERMICOMPOSTING BIN:

1. Begin by removing the lid to the 17-gallon bin and setting the 12-gallon bin inside the 17- gallon bin.
2. Next, use the drill with the hole saw bit to drill 4 holes that are equally spaced lengthwise on the right side of one of the lids. Repeat this on the left long side of the lid.
3. Use a sanding sponge or sandpaper to score the inside of each hole. Then, score the area around each hole (on the inside surface of the lid) to allow the screen to adhere to the inside of the plastic lid.
4. Add the exterior liquid adhesive to the area around each hole on the inside of the lid. Take a screen repair patch (or cut a

Materials

- Utility knife
- 17-gallon plastic bin with lid
- 12-gallon plastic bin with lid
- Drill with medium drill bit
- ½" drill bit
- 1 ½" hole saw
- Screen patch kit x2
- Sanding sponge
- Scissors
- Heavy duty liquid adhesive (for exterior)
- Square ruler
- Plastic bucket
- Coir block (soilless media)
- Paper towels
- Food waste (fruit and vegetable)
- Red wiggler worms (*Eisenia foetida*), roughly 1 lb.

piece of screen with scissors to the size of squares needed) and press them firmly into the glue to cover the hole, creating 8 circular screen vents in the lid.

5. Give the glue time to dry and adhere the screen patches to the lid so there is no way for worms to escape.
6. Next, you'll use the second lid to create a divider that will set between the layers of old and new compost and allow worms to move between the layers in the bin.
7. Use the drill and hole saw bit to drill holes equally spaced apart that cover the surface of the lid.
8. Take a utility knife and cut around the inside flat edge of the lid, removing the outside raised edges. You can use a square ruler to help guide the cuts to make them straighter. Use scissors to round off the corners of the divider, so that you are left with a flat plastic divider with holes throughout it that will sit inside the bin.
9. Next, use the drill and a medium drill bit to drill holes throughout the bottom of the 12-gallon bin. (These holes will allow liquid drainage from the 12-gallon bin into the 17-gallon bin below.)
10. Now you are ready to assemble your vermicomposting bin and create a worm habitat inside! Begin by placing the 12-gallon bin (with holes in the bottom) inside the 17-gallon bin.
11. Fill a plastic bucket with water (untreated or rainwater is preferable). Use the water to moisten paper towel or newspaper strips and place them in the bottom of the 12-gallon bin. Add any soilless materials you have or moistened cardboard to the layer of paper towels or newspaper.
12. Now add purchased red wiggler worms to the layer in the 12-gallon bin you have just created.
13. Add collected food waste to the worm habitat—food waste that is appropriate includes overripe fruit and vegetables or cuttings and scraps. You should NOT add eggshells (as worms cannot break them down), meat, dairy products, oils, or fatty foods to your worm bin.
14. Cover the worms and food waste with another layer of paper towels or newspaper that is wet or damp. Continue to create 1 or 2 more layers of damp materials, worms, and food scraps in your bin.
15. Cover the top bin with the lid with screen vents and let the worms go to work!!! Make sure that your worm bin is kept at a temperature of 55–75 degrees Fahrenheit to ensure that the worms have the best working conditions.

Next Steps

Check your vermicomposting bin once a week and move the material in the bin around to help aerate it. You may want to add more strips of newspaper or paper towel over the top of the pile to cover smells. Once you begin to start seeing a layer of worm castes (black gold!) in your bin, add the plastic lid divider with holes you created on top of the pile to separate the layers of compost and give worms a chance to wriggle up to new compost material. Continue to add material to your bin. You should be ready to harvest compost for your gardens and houseplants in 1–2 months. In the bottom of your bin, you should find worm tea, which is an organic liquid fertilizer that has drained out of the compost above. Pour this worm tea on plants to give them additional nutrients and keep away insects! You can even give this black gold and worm tea to your friends and family as an earth-friendly organic gift for their own plants!

Links

https://foodprint.org/eating-sustainably/composting-and-food-waste/vermicomposting-101

https://www.epa.gov/sustainable-management-food/types-composting-and-understanding-process

https://extension.illinois.edu/worms/live/

https://www.in.gov/idem/iee/2367.htm