

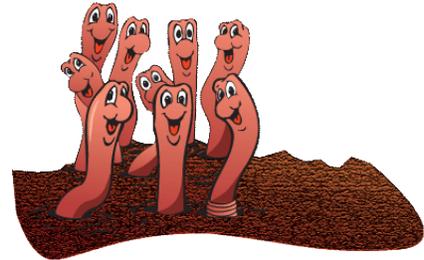


The Wonderful World of Worms

By Ronda Williams, Extension Educator, 4-H Youth Development/CED, Darke County (OSU Extension)

Objectives

- Increase awareness of the natural environment
- Become aware of the role earthworms play in plant and soil health
- Learn about the behavior characteristics of worms
- Learn the basics of composting with red wiggler worms



Group Size

6-8 children per adult volunteer

Time Frame

This lesson is designed for a group meeting between 30 and 60 minutes. It can be used with youth or adults in a variety of settings.

Background

There are over 2,000 species of earthworms worldwide. They can live in the water or in the soil. Earthworms play a vital role in the environment by helping to improve soil conditions.

Soil-dwelling nightcrawlers burrow extensively in the ground and perform many useful functions. They aerate the soil by making tunnels. This loosening of the soil allows room for plant roots to grow. Worm tunnels permit water to flow more freely throughout the soil, enhancing plant growth. Nightcrawlers move organic materials (leaves, plant matter) deeper into the soil which helps to fertilize the soil. While nightcrawlers thrive in the outdoor environment, they are not suitable for worm bins or composting.

For purposes of this lesson, we use red wigglers. Red wigglers are readily available through the mail or you may find them at your local bait shop. In addition, check in your area to see if there is a "worm farmer" who raises red wigglers and would be willing to donate a pound or so to your group.

Composting with Worms

The best type of worms to use in a composting bin is the red wiggler (*Eisenia foetida*). Red wigglers like to live in small, compact areas and do not burrow deeply into the ground. They do not mind being handled and will tolerate a variety of living conditions. Red wigglers eat about half of their body weight each day and will consume a variety of organic materials.

Your worm bin can be a simple plastic bin or something more elaborate. You can create a bin by drilling holes in a plastic bin and covering it with dark paper or fabric or putting it in a box. Drill very tiny holes along the sides to allow for air circulation. Or, you can purchase a specially made commercial worm bin.



The bedding in your worm bin should be organic material, such as shredded newspaper (not the “slick” ad paper with different color inks), soil, shredded cardboard, aged manure, etc. Be sure that the newspaper or cardboard are in narrow strips as it will break down faster in the bin. It is important that the bedding material be moist, but not soaking wet. Worms need moisture or their skin dries out, but too much moisture will cause them to drown.

Red wigglers will survive in a temperature between 40°F and 85°F, but prefer 70°F – 75°F. They should be in a dark location, free from drafts.

Worms will eat a variety of organic materials. They prefer plant matter (vegetable peels, lettuce), coffee grounds, crushed eggshells, etc. They do not like dairy products, meat, bones, or oily substances. See the list of preferred foods included with this handout.

As the worms break down the plant matter, they leave behind worm castings (worm poop). Castings are an excellent source of fertilizer for your plants and gardens. Your worm bedding must be changed every one or two months as plant matter is broken down, because the worms cannot exist in a bin that consists of only worm castings. Empty your bin onto a plastic tarp to separate the worms from their castings. Castings appear as a fine black grainy substance. Once you have separated the worms from their castings, return your worms to your bin with new bedding. Use the castings as fertilizer for your garden or houseplants.

Worms lay eggs, called cocoons, and will readily reproduce if their bin environment is favorable. Each cocoon contains five or six baby worms. Baby worms are small and white when hatched. If your worms are actively reproducing, then you know that the living conditions in your worm bin are ideal.

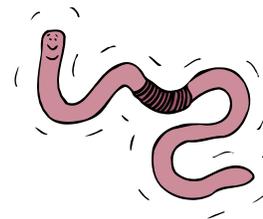
Resources You Can Use

Appelhof, Mary (1997). *Worms Eat My Garbage*. Kalamazoo, MI: Flower Press
Cronin, Doreen (2003). *Diary of a Worm*. New York, NY: Scholastic, Inc.
Ross, Michael Elson (1996). *Wormology*. Minneapolis, MN: Carolrhoda Books, Inc.

A great website for kids

The Adventures of Herman the Worm: <http://urbanext.illinois.edu/worms/>

Worm Experiments



You will need

- Red Wiggler Worms
- Flashlights (one per group)
- Sandpaper (one small square per group)
- Paper Towels (one damp paper towel per group; one dry paper towel per group)
- Vinegar (a small amount)
- Spray bottle filled with water
- Hand wipes (one per participant)

Before conducting the worm experiments with your group, go over some basic worm facts (see document included with this handout). This will help them to understand some basic worm behaviors.

Distribute the Worm Observation Chart and ask each participant to make their predictions as to what the worms will do during each experiment. After each experiment is conducted, ask the participants to record what the worms actually did during the experiment. Were the participants' predictions correct?

For best results, divide your group into teams of four or five participants. Give each group two worms on a damp paper towel. Announce that members do not have to touch the worms if they do not want to. Worms should be handled gently and participants should not "pound" on the table or talk in loud voices as the worms are extremely sensitive to vibrations.

Experiment #1 – Which texture appeals to worms?

Give each group a piece of sandpaper. Instruct them to position their worms so that they are half on the sandpaper and half on the paper towel. Watch what happens. (1) Did the worms stay on the sandpaper or did they move to the wet paper towel? (2) Ask participants if they know how they can easily tell a worm's head from its tail.

Answer: (1) Worms will typically move towards the wet paper towel. Their skin is extremely sensitive and the rough texture of the sandpaper makes them uncomfortable. They also require a damp surface so that their skin does not dry out. (2) When a worm moves, it leads with its head. Therefore, the head end is the direction in which the worm is moving.

Experiment #2 – How do worms react to light?

Instruct each group to place their worms back on to the wet paper towel. Collect the sandpaper and give each group a flashlight. Have the participants turn on the flashlight and hold it so that it is approximately one inch above the worms. How do the worms react? Do they stay still or move around?

Answer: Worms will typically move around to try to escape the light. Remind participants that worms live in a dark environment so they are sensitive to bright lights. Also, the heat from the light dries out their skin. Worms require a moist, dark environment in order to survive.

Experiment #3 – Which surface will worms prefer?

Collect the flashlights and give each group a dry paper towel. Instruct them to place their worms so that they are half on the wet surface and half on the dry surface. Watch what happens. Do the worms move towards the wet surface or the dry surface?

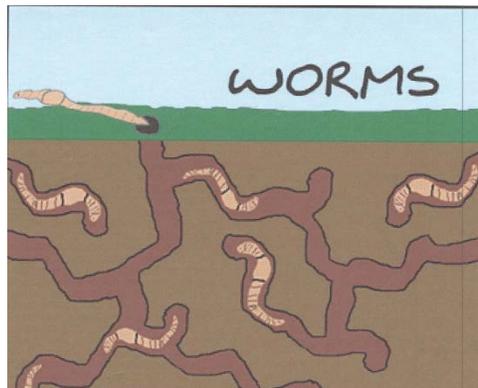
Answer: Worms will typically move towards the wet surface. It feels more comfortable on their skin and they require moisture so that their skin does not dry out.

Experiment #4 – What happens when a worm is exposed to vinegar?

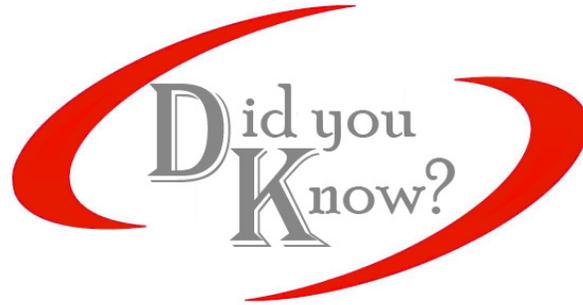
Instruct each group to place their worms on the wet paper towel. Visit each group and put a small amount of vinegar on the dry paper towel. Instruct participants to place their worms on the vinegar and watch what happens. Once they observe how the worms react, they should very quickly and gently return the worms to the wet paper towel. What happens when the worms are placed on the paper towel with vinegar? Do they stay still or do they move around?

Answer: The worms will begin to move around very quickly when they are placed on the vinegar. How do worms breathe? They breathe through their skin and the vinegar interferes with their ability to breathe. Explain to the participants that if they use a lot of chemicals or pesticides in their gardens, they will most likely not have many worms. Chemicals irritate the worms and they do not thrive in an environment which contains lots of chemicals. An abundance of worms in the soil typically means the soil is healthy and fairly free of chemical irritants.

Collect all of the worms and return them to your worm bin. Dispose of any paper towels and other trash. Give each participant a hand wipe so that they can clean their hands after handling the worms.



Worm Facts



- Worms are soil engineers.
 - They move rocks and debris, and tunnel through the soil. Loosening the soil incorporates air and allows plants to grow healthy and strong.
- Worms are recyclers.
 - They turn rotten leaves and plant matter into soil.
- Worms are magicians.
 - They swallow dirt and it comes out as worm castings (fertilizer for the soil).
- Worms do not have arms, legs, or eyes.
 - They have tiny bristles (called “setae”) on their underneath which allows them to dig and move.
 - Worms are sensitive to light, even though they do not have eyes.
- Worms have a mouth, but no teeth.
 - Their mouth is on their head (anterior) end.
 - Their tail is called their posterior.
- Worms live where there is food, moisture, oxygen, and a favorable temperature.
- Worms are cold-blooded animals.
- Worms breathe through their skin.
- Worms eat their weight in food every day.
- Too much water will drown a worm.
 - However, they need to have some moisture or they will die.
- Worms are invertebrates. They do not have any bones.
 - They have five hearts.
 - They have a digestive system, reproductive system, and muscle system.

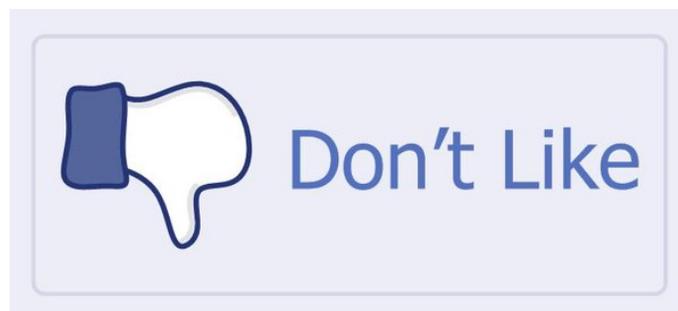
What Worms Like to Eat



(Cut or tear food into small pieces as the worms do not have teeth.)

- Peels: potato, carrot, apple, banana
- Lettuce
- Cabbage
- Celery
- Cornmeal
- Oatmeal
- Crushed eggshells
- Coffee grounds
- Paper –newspaper (not slick magazine paper or inserts from newspapers with colored ink)
- Leaves

What Worms Do Not Like to Eat



- Meat
- Dairy foods, cheese, butter
- Oily foods (salad dressings)
- Onions
- Chocolate

Worm Observation Chart

Name _____



	Prediction		Observation	
Sandpaper	Stay	Move	Stay	Move
Light	Stay	Move	Stay	Move
Wet/Dry Surface	Stay	Move	Stay	Move
Vinegar	Stay	Move	Stay	Move