

THE WONDROUS WORM

Brochure description: Do you ever wonder about the life under your feet? Did you finish all your lunch today? What do these two questions have in common? Learn about the wondrous worm and how it can turn garbage into vermicompost.

Age Level: Grades 1-3

MN Academic Standards for Science:

1st Grade IV B, IV F; 2nd Grade IV B, IV C; 3rd Grade IV B, IV C

Program Length: 45 minutes

Key Concepts:

1. The basic anatomy of an earthworm consists of a mouth, five hearts, segments called somites, small hairs called setae, clitellum band for reproduction, digestive system and anus.
2. The red wiggler species of earthworm is especially suited for worm box composting.
3. How to build a worm bin for vermiculture.
4. Practicing vermicomposting has several environmental benefits.

Supply List:

- 12-15 gallon plastic bin
- 3-inch stack of newspaper
- 1 gallon bag of shredded newspaper
- 2 cups of compost
- 1 cup potting soil without fertilizer
- 1 cup corn meal
- 1 cup sample of worm castings
- paper lunch bag containing sandwich, fruit and cookie
- Poster of basic earthworm anatomy
- Slinky
- Reference book –Worms Eat My Garbage by Mary Appelhof

Introduction:

Do you every wonder about the life under your feet? Did you eat all your lunch today? What happens to what you did not eat? What do we call the uneaten food? And how much garbage do we make? Do you know of a way to recycle food waste?

The wondrous worm can help reduce our waste by turning it into vermicompost. Vermi is latin for worm and compost is decomposed organic matter sometimes known as brown manure. Let's find out how a worm makes compost from food waste. But first we must learn about the parts of an earthworm.

Basic worm anatomy:

All worms have a mouth which they use to force open cracks in the soil as well as eat. They have no teeth or tongue. Worms have no ears or nose. They do have a kind of eye which can detect light. They have five hearts to pump and circulate their blood throughout their long body. Worms

have no lungs since they breathe through their skin. The slimy mucous on their skin helps them absorb oxygen and slide through the soil. Their body has up to 150 segments or muscle rings called somites that can be extended or retracted for movement and burrowing. (Demonstrate using the Slinky.) Worms also have small hairs on each segment called setae which help them grip the surface. A worm has a wide band called a clitellum which is the reproductive structure. Each worm has both male and female organs but they do need to mate with another worm. They produce a cocoon which contains eggs that after three weeks hatch into baby worms. Well fed worms can produce up to 400 cocoons per year.

Have you ever heard that if you cut a worm in two parts that both will live and grow? The truth is that worm bodies will regenerate or grow back if cut anywhere along the rear end. However, if the body is cut before the 13th segment the worm will die. So generally worms can re-grow their tail but not their head.

A worm's digestive system begins with soil, food or organic matter taken in through the mouth. As it passes through the worm's body it mixes with digestive fluids, provides energy for the worm to live and breaks down before it comes out the other end as worm castings. (Show worm castings sample.) Worm castings are the main reason people have worm boxes. The worm castings are rich in organic matter and can be used as a fertilizer to help plants grow.

Compost worms:

Let's get back to your sack lunch and the uneaten food waste. Let's learn how we can set up a house for worms to eat our garbage and turn it into rich organic compost.

There are over 2500 different species of earthworms but there's one that is the best – the Red Wiggler. It's scientific name is "Eisenia Fetida" (I See Nee A Fet Ida). Even though it's called a red wiggler, it can be purple, red, maroon or red with yellow stripes in alternating bands. Full grown it can be 1-5 inches long and have 60-120 segments. This worm tolerates a wide range of environmental conditions such as temperatures from 55-75 degrees F., different soil types and can actually survive in water longer than other worms. It reproduces rapidly – from the time it's born to three months later it can become a grandparent. These worms have been known to live up to 15 years but usually only live 2-5 years in a compost bin.

The most amazing thing about a red wiggler is that it can eat half it's own weight in food every day! So a worm bin with one pound of worms (about 1000 of them) can turn one-half pound of food waste into rich vermicompost every day. How much is that in a month? In a year? For an average household family?

(Activity: Weigh or estimate the weight of each student's lunch waste or all the class's.)

Worm bin:

What does it take to have a worm bin so food scraps can become vermicompost?

Bins can be plastic tubs or buckets, wooden boxes or commercially produced bins. (Show the sample worm bin.) The ideal worm bin should be no more than 12-18 inches deep; it needs to have holes in the bottom, sides and top; with the holes covered in screen or cloth mesh to prevent the soil from coming out. A rule of thumb is one square foot of surface area for one pound of garbage per week. You should probably start out with at least 500 worms which is one-half pound.

Bedding is the material in which the worms live and work. You will bury your food waste under the bedding so the worms can find it to eat. It also holds moisture that the worms need to live. Common materials used are shredded newspaper but also cardboard, dried leaves, coconut fiber,

small wood chips and bark. Initially you need to add some starter compost, potting soil and corn meal to the bedding mix.

Moisture and temperature condition of the worm bin are important for their health. Place the bin in a location where the temperature is between 55-75 degrees. If you place it outside in the sun they will overheat, or in the cold they will freeze. To initially set proper moisture, you need to add water to the bedding material. For example, 3 lbs of shredded newspaper will soak up about a gallon of water. To check for proper moisture content, grab a handful of the bedding and squeeze. The handful should feel damp, stick lightly together but not drip water.

Worms can be purchased from online or some local stores. Search for “red wigglers” on the internet and you’ll find many sources.

Food for worms is easy to find. The best food is vegetable and fruit waste. Can you name some types of fruit or vegetable waste? (Banana peels, apple cores, carrot peelings, lettuce, cucumbers, etc.) Avoid large amounts of citrus (oranges, etc.). Also, you can feed them grain products. Name some examples – bread, cereal, corn meal, pasta, etc. Worms like coffee grounds and tea bags, or clean egg shells broken into small pieces.

Don’t feed worms animal products such as meat, bones, dairy products, fat or oil. Avoid highly salted foods. Salt kills worms!

When you feed your worms you should bury the food under 1-2 inches of bedding. Rotate the location of the food in different sections of the bin. How often you feed is determined more by how much they are eating than by a set schedule. Check the bin to see if the food is being consumed before you add more. If your bin starts to stink like garbage, you are probably feeding them too much. Remember worms have small mouths and no teeth so it works best if you can give them small pieces or even grind the waste.

Harvesting Vermicompost:

In three to six months, your worm bin should be ready to harvest your homemade organic compost. This material will consist of everything in the bin except your worms. So it includes the mixture of bedding, compost and worm castings. But you need to separate out the worms for your next batch and continue vermicomposting. There are several methods. You can dump and hand sort; use a screen to sift the worms from the compost; or you can try to lure them into a new section of the bin with fresh bedding and food. They all take some time but the end result is worth it. The book, Worms Eat My Garbage, describes each with excellent drawings of the techniques.

Environmental benefits:

Creating your own vermicompost has a number of valuable environmental benefits. First, you are recycling and reducing household garbage that otherwise goes into a landfill. Second, you are creating a rich organic fertilizer that can be used on house plants or in the garden. Third, it helps you understand how wondrous an earthworm is and what it does naturally.

We take care of nature and nature takes care of us.

References:

Weisenhorn, Julie, "Vermiculture: Promote Global Worming!", December 2000,
<http://www.sustland.umn.edu/maint/docs/Vermiculture.doc>

Appelhof, Mary, Worms Eat My Garbage, Second Edition, 1997, Flower Press, Kalamazoo, MI

The Autobiography of Squirmin' Herman the Worm, <http://www.urbanext.uiuc.edu/worms/>,
University of Illinois Extension's website

Earthworm Photo and Basic Anatomy Graphic

