



# May 2010 - Roots & Worms

What do worms do? Why are roots important? Do we really need either of them?

You might be surprised by what you'll find out about these two simple things!

## Gardening Science Projects

## Watch Roots Grow

You may know that plants grow roots, but usually we just see the part of the plant above the ground. Here's an easy way to watch seeds sprout and roots start to grow.

What You Will Need:

- Plastic zip-top sandwich bag
- Paper towel
- Stapler
- Seeds (sunflower seeds work well)
- Tape

What To Do:

- 1. Fold the paper towel in half and then in half again into a square.
- 2. Get the paper towel square wet and then gently squeeze it out. It should be damp but not dripping.
- 3. Place the wet paper towel into the plastic bag.
- 4. Staple a row of four staples spaced evenly across the bag, about 1 1/2" from the zipper to form a little pocket. Staple all the way through the front of the bag, the paper towel, and the back of the bag.
- 5. With the bag laying flat, place 3 seeds on top of the paper towel inside the pocket. Line the seeds up between the staples so that the roots can grow down easily. (The seeds will be sandwiched between the front of the bag and the folded paper towel.)
- 6. Tape the top edges of your bag to a window that gets a lot of sunlight. The seeds should face outside (towards the sun). You may need to adjust the tape to make sure the top of the bag stays open so that mold won't grow inside.
- 7. Carefully lift the bottom of the bag up to peek at your seeds each day. Depending on what kind of seeds you planted, they should sprout within a few days or a week. (Our sunflower seeds began to show roots after just two days!)

## What's Happening?

Seeds need certain conditions in order to start growing. Until it is in the right conditions, the seed is *dormant* - it's kind of like it is asleep. When the seed has everything that it needs to start growing (warmth, oxygen, and water), it will "wake up" and sprout, or *germinate*. Once the seed germinates, it will begin growing roots going downwards and a stem going up. As the plant continues to grow, it needs sunlight, oxygen (from the air), water, and nutrients from soil.

Check on your seeds each day and notice how quickly the roots grow once they appear. At first they might just grow as one root that keeps getting longer, but after a few days, they will likely start to have other little roots growing in different directions. Those additional roots help the plant reach more soil to find water and nutrients and also help keep the plant stable, so it won't easily fall over or be pulled out of the ground. Even though your seeds aren't in soil, the roots know they need to grow that way. After about a week, you can carefully take the tiny plants out of the bag and plant their roots in the ground outside or in a pot with potting soil if you want to continue watching the plants grow.

## How Do Plants Drink?

You can watch a root (a carrot) "drink" up water with this easy experiment.

What You Will Need:

- Carrot
- Glass of water
- Blue food coloring
- A sharp knife & a cutting board
- An adult to help

## What To Do:

- 1. Mix a few drops of the food coloring into the glass of water.
- 2. Place the carrot in the water.
- 3. After a few hours, pull the carrot out and have an adult cut off a small section near the tip.
- 4. Look at both the carrot and the piece that was cut off. You should see blue dots on the inside of those two pieces.

## What's Happening?

The blue dots show where the water is being carried through the root. A plant's roots bring water and nutrients up to its stem and leaves through hollow tubes. A carrot is a root vegetable. Since you added coloring to the water you put your root (the carrot) in, the tubes showed up as blue dots when you cut the carrot's tip. All plants need water and nutrients in order to grow. Cut off another piece of the carrot, looking for the same blue dots again. Keep cutting sections off the carrot. How far did the water travel up the carrot? If the carrot you used had a green top still connected to it, the water probably traveled all the way up to the top part, which is the stem of the carrot plant.

In order for a carrot to grow when it's in the ground, the green plant part above the ground needs to be healthy. It stays healthy by getting water and nutrients from the root, which eventually grows into a thick orange root that's good to eat!

## **Build a Wormery**

Want to learn about worms? We think the best way is to watch them! Here's how you can collect some worms and watch what they do.

What You Will Need:

- Clear plastic 2-liter soda bottle
- Scissors
- Sand, soft soil, garden soil, compost (as many different types of soil as you can find)
- Water
- Earthworms (about 5)
- Leaves
- Piece of construction paper or cardboard
- An adult to help

#### What To Do:

- 1. The first thing you need to do is prepare a place for worms to live called a wormery. Clean the soda bottle and remove the label the best you can. Have an adult help you cut off the top of the bottle where it starts to get smaller to form the neck of the bottle.
- 2. Fill it with alternating layers of soil and sand. Use at least two different types of soil, but the more you have, the better.
- 3. Add water to the soil to get it damp, but not too wet or goopy. Place some leaves on top of the soil.
- 4. Once your wormery is ready, you'll need to get some worms. The easiest way is to buy some from a local bait shop or pet supply store. However, it's not hard to find them out in your yard! If you have a bare patch of earth, try watering the area and then placing a piece of cardboard, carpet, or wood over it. Leave it for a day and then lift the cardboard off the dirt to find the worms hidden underneath. You can also just start digging in the dirt to find worms. (Just make sure you get permission from an adult before you start.)
- 5. As you find worms, carefully put them into the wormery. You can use a twig or a plastic cup to gently scoop them up and move them. Try to find 4-6 worms.
- 6. Once your worms are in, cover the top of the bottle with construction paper or cardboard to make it dark for your worms.
- 7. Over the next few days and weeks, watch them tunnel through the soil and leaves and see how long it takes for the layers of soil to become mixed together. You may even see the worms tunnel along the side of the bottle.
- 8. Worms need their soil to be moist so that they can breathe and not dry out. Check on the soil every day. If it looks like it is starting to dry out, add a little water to keep it damp.
- 9. When you are done watching the worms, simply dump the entire contents (worms, too!) back in your garden or a patch of dirt in your yard.

## What's Happening?

Worms can move an amazing amount of soil for their small size. An earthworm can eat its own weight in soil and other matter every day! As you saw in this project, worms help till or turn up the soil as they tunnel through it. Worms make a natural fertilizer. If you place compost (plant material like fruit or vegetable peels) on your garden you can be sure some friendly earthworms will help get it down to the roots of your plants and provide your soil with lots of important and rich nutrients, which in turn will help your plants grow.

## Fun Facts

- Baby earthworms hatch from special tiny cocoons that are usually about the size of a grain of rice.
- The largest earthworm ever found was about 22 feet long! It lived in South

## Silly Science

- What kind of worm likes to do math?
  *An inch worm!*
- What is a worm's favorite food?
- A sand-wich!
- The early bird said with a tweet,
  "Come up and I'll give you a sweet."
  "Thanks for dessert, but I'd rather eat dirt,"
   Said the worm as he beat a retreat.

## Way Cool Websites

- Do you know what worms eat? <u>Test your knowledge</u> by clicking on the pictures of the foods you think a worm would eat.
- Visit <u>Herman the Worm</u> to learn all sort of interesting things about the life of an earthworm.
- <u>This video</u> show radishes growing. The video has been sped up so that you can see it happen in just a few minutes!
- Plant some seeds and then learn the parts of a plant on this site.

# **Teacher Tidbits**

## **All About Earthworms**

Earthworms live in the soil of every continent in the world except for Antarctica! There are about 2700 different kinds of them.

They aren't much to look at (they may even seem a little gross), but earthworms are really good at what they do. You might be surprised to learn that their job is a very important one. So, what do they do? They dig tunnels through soil in the ground. As they go, they eat, digest their food, and then excrete it. That doesn't sound very important. Well, it turns out, the "waste" that

worms excrete is actually very valuable for soil. It is full of nutrients that help plants grow. The tunnels they form also help keep the soil healthy by supplying it with oxygen and making it easier for water to soak into the ground. Worms periodically come up to the surface of the ground to find food, then go back down and continue tunneling. This process helps mix up the richer soil from farther down in the earth with the soil at the top. This is important because lots of the nutrients in topsoil have already been used up by plants and the soil down below has more nutrients. All of these things make the soil better for plants to grow in. This is important for us since most of our food comes from plants or from animals that eat plants.

Earthworms are excellent recyclers! They eat things like fallen leaves and decaying animals. They can also eat food scraps, fruit and vegetable peels, eggshells, and some garbage (like coffee grounds and tea bags). Organic matter - something that came from a living thing, such as a plant or animal - will break down on its own eventually, but an earthworm can eat and digest an amount of food and dirt equal to its own weight in a single day, so the process goes much faster with their help! This keeps the soil full of helpful nutrients.

Worms need food, oxygen, and moisture to live. They breathe through their skin instead of with lungs. Oxygen from water in the ground can pass through a worm's skin to keep it alive. They like the soil to be damp so that their skin can stay moist and slimy, but not too wet. If you go outside after a rainstorm, you might be able to spot some earthworms on the sidewalk. Sometimes after heavy rain, earthworms come up to the surface because they've gotten too much water while in the ground. UV rays from sunlight can kill worms very quickly, though, so if the rain storm happens during the day and the sun starts shining again, earthworms that have come up to the surface often get burned by the sun's rays and die. If you happen to see any earthworms on the sidewalk, it's a good idea to use a stick to move them back to an area with dirt.

#### Anatomy of an Earthworm

Earthworms are very simple creatures. They don't have arms, legs, or ears. Instead of eyes, they have special cells on the outsides of their body that are very sensitive to light. Those cells help them see light, but nothing else. They have small simple brains that are used to help them move their bodies. They can also have up to five hearts to help pump blood through their long bodies.



An earthworm's body is divided into lots of segments and they have a head end and a hind end. The very first of the tiny segments is the earthworm's mouth and the last segment is its anus, where waste, called *castings*, exits its body. Both ends look similar, but you can tell the head end by the thick ring-like segment that is located near it.

An earthworm's mouth is very small, but it is strong enough that it can hold onto a leaf and drag it around as the worm moves! When an earthworm eats, it uses a muscle in its throat to move the food down into a little space called a crop. The food stays in the crop for a little while, sort of how food stays in your stomach for awhile. Then it is pushed into another space called a gizzard. The gizzard has large grains of sand and small stones in it from the sand and dirt the worm has eaten. To digest the food, the gizzard squeezes in and out and the sand and stones rub together and grind up the food! From there it passes through the worm's intestines

where the worm gets all the nutrition it needs from the food. Then it exits the worm's body as castings.



#### **All About Roots**

Most plants start their life as some sort of seed. A seed has all of the information it needs to grow into a plant, but before it can grow, it needs certain conditions to be right. When it has everything it needs (warmth, oxygen, and water), it will sprout. The sprouted seed will soon grow a *stem* above the ground. Below the ground, it will grow *roots*. The roots grow downwards into the soil. Roots are very important for plants. They help hold the plant in place in the soil while it grows. They also provide water and nutrients that the plant can't live without. The roots soak up nutrients and water from soil, then the

nutrients move up the roots into the stem of the plant to reach the leaves, flowers, and fruit. Roots have tiny hairs on them to help absorb water and nutrients from the soil. Sometimes plants use their roots to store extra food, especially during the winter.

Do you remember what plants need in order to grow? They need sunlight, air, and water. They also need nutrients. The best way for plants to get nutrients is from soil. As you've already learned, earthworms help provide soil with lots of great nutrients. A plant's roots are the parts that allow a plant to use the nutrients that the worms provide. Roots help plants grow, and then earthworms eat the leftover parts of plants and the cycle starts all over again!

There are several different kinds of roots. Some plants have many roots and some just have a few. Trees have large systems of roots - some really big ones to help hold the tree up safely in the ground, and lots of smaller ones to help the tree get water and nutrients. Some vegetables, like carrots, radishes, and turnips, are actually roots! They are called taproots, because they just have one long main root. Sugar comes from a type of root, called a sugar beet, which is similar to a root vegetable.

Besides keeping a plant in place, roots can help keep soil in place. For example, the roots from trees growing along the edge of a river or near an ocean can help hold the soil in place when water washes over it.

#### **Printable Worksheet**

The worksheet below can be used as either a matching game (by cutting out all eight root and plant pictures) or as a cut-and-paste review of different roots that plants can have. Take a moment to discuss how different kinds of plants use their different types of roots and why they might be shaped the way they are.

# Plants and Roots

Do you know what kind of plants grow the roots below? Cut out the plant pictures on the next page and glue each one above the correct root picture.





