VERMICOMPOSTING

WHAT IS VERMICOMPOSTING?

Verme is the Latin word for worm. Vermicomposting is a way of making compost with the help of red wiggler earthworms. These worms can eat and expel close to their own weight every day. Because the worms need to stay warm, vermicomposting is usually done indoors in Canada. People use vermicomposting to process food scraps in their homes, schools and offices - and often come to think of the worms as helpful pets!

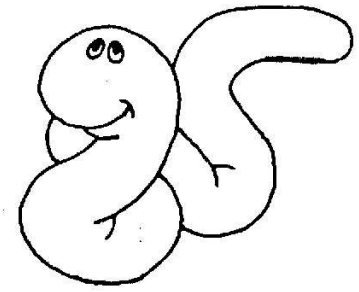
Vermicompost is made up of worm "castings" - another name for worm poop! Fortunately these castings are safe to handle and only have a faint earthy smell similar to soil. Vermicompost that is ready for harvest is dark, crumbly and moist. A newly established bin can have harvestable compost in as little as three months. This valuable material can be used to grow healthy plants indoors and out.

OUTDOOR COMPOSTING VS. VERMICOMPOSTING

Feature	Outdoor Composting	Vermicomposting
Who's at work:	Bacteria, fungi	Worms, bacteria, fungi
What goes in:	Food scraps, grass clippings, plant stalks, leaves, etc.	Food scraps, newsprint or other bedding
Pile size:	The best size for an outdoor compost is $1m^3$ or bigger to encourage heating.	The vermicompost materials shouldn't be deeper than about 20 cm.
Temperature:	The microbes are active between about 5-70°C and go dormant in winter.	Worms prefer 16-27°C. Freezing kills worms and their eggs.
Care:	Outdoor composting requires sporadic care; inactive piles can be revived.	Vermicompost requires consistent low level care at least every couple weeks.
Advantages:	Outdoor composting handles lots of materials and doesn't take much work.	Vermicompost can be done indoors and the compost is more fertile.

THE WORMS

It takes a special worm to thrive in the enclosed, high-food environment of a worm bin. In nature, this type of worm lives in mild climates in the leaves on the forest floor or in manure piles. The earthworms found on the prairies do not like to 'live in their food' and need room to burrow, so they are not suitable for vermicomposting.



The most frequently used worms for vermicomposting are red wigglers (*Eisenia foetida)*. They are also often sold as bait worms for fishing. They thrive in vermicompost bins. The food they eat affects their colour, so a "red" wiggler can actually be purple, red or brown, and may have noticeable stripes on its top side.

Worms aren't the only creatures that live in a bin ecosystem. Bacteria and fungi already present on the food start the breakdown process for the worms. Worms eat the bacteria and fungi, along with the bedding and softened food, to produce vermicompost.

Red wigglers can live for three or four years. Each worm can release 100 or more eggs per year, and two or more young worms hatch from a single egg. A baby worm takes four to six weeks to reach sexual maturity. Every vermicomposter becomes a worm rancher! If conditions are good, you will double your worm population in six months. If the worms become crowded and you do not remove any, then worms will slow down their reproduction on their own.

WHERE TO GET WORMS

Look first for people you know who are already vermicomposting. They will have extra worms periodically that they can share. It is also a good idea to check local exchange sites such as kijiji.ca, using search terms such as "red worms" or "red wigglers."

The Saskatchewan Waste Reduction Council also keeps a list of active vermicomposters with worms available for sale In the Saskatchewan area. Call 306-931-3249, or email compost@swrc.ca for details.

SETTING UP

Bins

A variety of containers make satisfactory worm bins, including wooden boxes, galvanized metal wash tubs, or plastic utility tubs.

If you want to use a container on hand, choose one that is "food safe" and has not been used to store chemicals, such as pesticides, which may kill the worms.

Hardware stores carry excellent potential worm bins in the plastic housewares department. Look for shallow storage bins with strong lids. New plastic containers should be rinsed before using.

What size of bin? How many worms?

For each 500 g of food waste produced each week, you will need at least 30 cm^2 of bin space. If you produce lots of food scraps, you might choose to have multiple smaller bins rather than one large one.

# People	Recommended Bin Size	Quantity of Worms
1 to 2	45 cm wide x 60 cm long x 30 cm high	About 500 g (about 1 lb.)
2 to 3	60 cm wide x 60 cm long x 30 cm high	About 1 kg (About 2 lbs.)
4 to 6	60 cm wide x 105 cm long x 30 cm high	1.5 to 2 kg (3 to 4 lbs.)

Keep in mind that the worms will reproduce, so you will be able to expand your composting capacity, or give some worms away, as time goes on.

The most important thing to remember in choosing a worm bin is that it should be shallow: 20 to 30 cm is good. Given bins of different shape but equal volume, the one with the greater surface area is preferable. The worms need to live near the surface in order to breathe.

Drill several smallish holes in the lid and sides of the bin for air circulation.

Bedding

Worm bins are filled with bedding to provide the worms with damp but aerated environment as well as a balanced diet. Common bedding materials include a combination of one or two of the following: newsprint, corrugated cardboard, coarse sawdust, and peat moss. A small amount of garden soil is also often added to introduce microbes and add grit for the worms to use in their gizzard. Vermicomposting without bedding is not advisable — it will produce a slimy, smelly mess.

The most accessible material for bedding is newspaper or cardboard. Tear newspaper and cardboard into 3 to 5 cm (1-2") strips and soak it with water. Squeeze out the excess water before adding this bedding material to the worm bin.

The bedding should be kept as moist as a wrung-out sponge—dry, but not soggy. Food scraps typically contain a lot of water. If you are using a plastic bin like the one described previously, usually the lid needs to be left ajar to let water evaporate. You can also add additional dry bedding to soak up some moisture. Wooden bins tend to be drier, so keep the lid closed and check to make sure the bedding stays moist.

You should add some more bedding on top of the bins every couple weeks as the old bedding breaks down.

The food

The worms need a steady supply of food to survive. They should be fed a minimum of every 2 weeks, but can be fed every day.

Recommended foods

Most kitchen scraps, including:

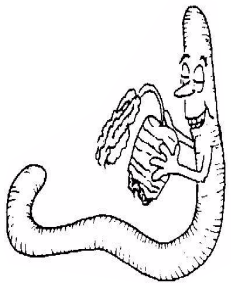
- coffee grounds/filters, tea bags
- vegetable and fruit peelings
- egg shells
- grain and pulse products like bread, pasta or cereal

Foods to be avoided

- Meat, fish, cheese, butter, oily foods, eggs —these foods will cause odours and attract unwanted insects.
- Citrus in large amounts – these materials are too acidic for the worms, so only add small amounts at a time, and use eggshells to balance the acidity.

Egg shells

If the bedding gets too acidic, the worms are uncomfortable and want to escape. Adding crushed eggshells keeps the bin a pleasant home for the worms.



To add egg shells:

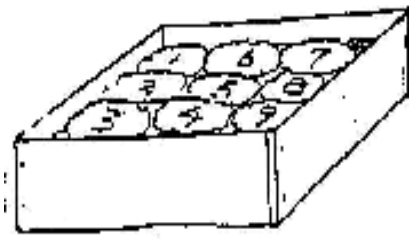
- rinse and let the egg shells dry
- place in a plastic bag and crush them with a rolling pin until they're quite fine
- add as needed (as much as one tablespoon per pound of worms per week)

Feeding the worms

One way to feed worms is to bury the food scraps as soon as you make them. This helps avoid flies or bad smells, but the food will be a little tougher for the worms to eat. Breakdown will go faster if items are chopped with a knife or buzzed in a food processor.

Another way is to keep a lidded plastic container next to the sink and collect the organic waste for a few days before adding it. Keep the container covered to avoid fruit flies. Make sure to cover this partially rotted food with 3 cm or more of bedding material to keep flies out. The food disappears more quickly with this method as the worms prefer to eat partially decomposed food.

For the best of both worlds (easy to eat worm food, without odours or flies), you can also freeze food scraps for a day or so before adding them to the bin. This kills any fruit fly eggs and helps make the food mushy once it thaws.



A six- or nine-spot system works well when burying food waste: mark the bin with numbers and bury each new addition in the next area up. If you bury your food scraps about twice a week, it will take about a month to get back to the first area. By then, most of the food waste should be broken down. If you still see a lot of intact food waste in the first area, your worm population may be too small and struggling to keep up. Slow down your feeding schedule a bit.

The temperature

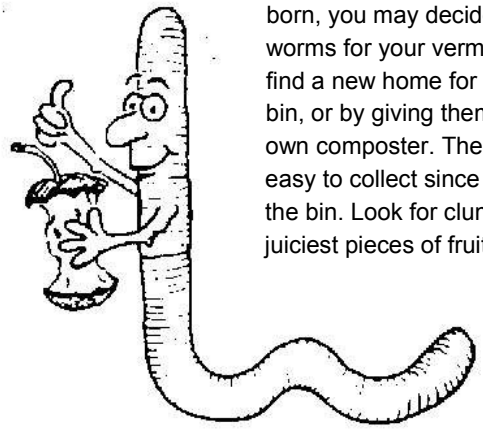
Red wigglers will survive in temperatures from 5 to 32°C, but the ideal temperature for them is between 16 to 27°C. If you keep the worm bin outside and the temperature drops below 5°C, be sure to bring your vermicomposter indoors.

Harvesting the compost and the worms

In 3 to 6 months, the worms will have created a fair amount of castings to harvest. There are two main ways to harvest the castings.

The first way is to move the compost to one side of the box and add fresh bedding and food to the other side. Only bury food on the new side. In six weeks, most of the worms will have migrated to the new bedding and you can harvest the finished compost from the other side.

The second way to separate worms from finished compost is to pour the contents of the bin onto a plastic garbage bag or plastic tarp under a bright light or in the sun. It is safe to touch, but you may prefer to use gloves. Spread the mixture out about 10 cm thick and wait for 30 minutes. The worms hate the light and will wiggle to bottom of the pile. Carefully remove the finished compost from the surface of the piles until you see worms. Repeat the procedure until the worms are concentrated at the bottom of the and most of the castings have been separated. Return the worms to their bin with fresh bedding and some food waste. Store the castings in a pail or use them right away.



At some point, with all the baby worms being born, you may decide there are too many worms for your vermicomposter. You could find a new home for them by starting a new bin, or by giving them to friends to start their own composter. The worms will be relatively easy to collect since there will be so many in the bin. Look for clumps of worms close to the juiciest pieces of fruit or other food.

How can I use the finished compost?

Vermicompost, like other compost, provides slow-release nutrients to your plants and adds valuable microbes to the soil. It also helps the soil hold moisture. Vermicompost can be used in a number of different ways:

- Sprinkle into a seed row when planting.
- Mix a handful into the soil when transplanting
- Sprinkle the compost around the base of your plants, or rake a thin layer into your lawn.
- Mix with commercial potting soil: one part vermicompost to three parts potting soil
- Make your own potting mix with equal parts vermicompost, peat moss, perlite and garden soil.
- Add a thin layer (0.5 cm") to the soil surface of potted plants every two to three months

- Make a simple compost tea for houseplants by putting 250 ml (1 cup) of vermicompost in a plastic mesh bag and placing it in a small pail with 2 L (2 quarts) of cool rain or dechlorinated water. Let the tea steep for half an hour, then use it to water plants. Only make as much compost tea as you can use at one time, as it cannot be stored.
- Give extra compost to friends!

Be aware that your finished compost will still contain any seeds that you have put in. Worms do not digest seeds, nor is the worm bin environment hot enough to kill them.

Potential problems

Mold

Molds are an active part of the vermicomposting process. The molds help break down the food and then the worms eat the mold and softened food. If there are people in your family or classroom that are sensitive to molds, they should avoid tending the vermicomposting system. If extreme mold sensitivities are a concern you may want to try other composting methods.

Fruit Flies and Fungus Gnats

Worm composting bins are relatively trouble-free. The most common problem people have with them is small flies.

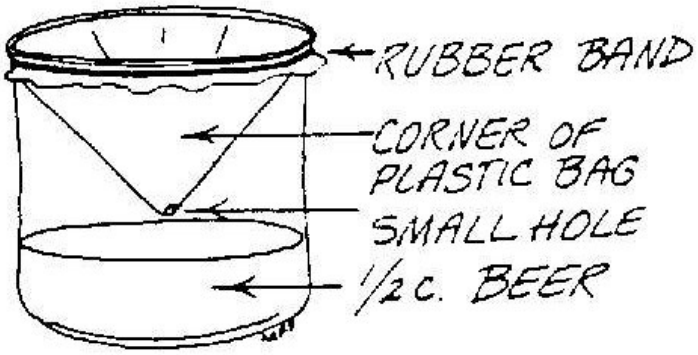
Fruit Flies

Fruit flies are small, light-coloured flies with colourful eyes. They can be kept to a minimum by fully covering fresh food wastes with a few inches of bedding. It is also very useful to keep 1 or 2 fruit fly traps near the vermicompost.

Fruit fly trap

All you'll need You'll need is a cup, a plastic bag, a rubber band, a drop of dish soap, and apple cider vinegar or beer.

To make the trap, pour a couple cm of apple cider vinegar or beer into a jar. Add a drop of dish soap (this breaks the surface



tension so flies cannot safely land on the liquid). Place the plastic bag over the mouth of the jar with one corner reaching down into the jar. Poke a small hole in the corner of the bag and secure it around the rim with the rubber band.

Fruit flies, attracted by the smell of fermentation, find their way through the tiny hole and either drown immediately or die of starvation when they cannot find their way out. Some versions of this trap do not use the bag, and simply rely on the liquid to drown the flies.

It is a good idea to dump and refresh the contents of the trap every week or so.

Fungus Gnats

If you have small black flies in your compost bin that don't seem very interested in your traps, you have the other common type of vermicompost pest. Fungus gnats eat fungi and less attracted to the smell of fermentation. Here are some control measures that can help:

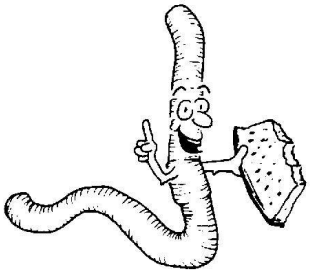
- Place some yellow sticky traps (such as Safer's Sticky Stiks) on or near the bin
- Let the bin dry out more by leaving the lid ajar or stirring in dry bedding
- Remove the bedding from the top of the bin and replace it. Put the old bedding outside.

If all else fails when controlling flies, add some food for the worms and then spread a 3 cm layer of dry peat moss overtop of the whole bin. Don't disturb this layer for about 2 weeks.

Bad smells

Normally, worm bins should only smell like wet soil. Bad smells in a worm bin come from too much food waste, too much moisture, or not enough fresh air. Odors can be controlled by:

- removing excess food waste
- loosening up dense bedding and worm castings to allow better air flow.
- stirring in the old bedding and adding fresh, dry bedding to the top of the bin
- taking the lid off and letting bin dry out more
- adding a few tablespoons of pulverized dried egg shells
- adding a couple of handfuls of mature compost or soil



Worms crawling up the sides of the bin

If a couple worms are crawling on the side of the bin, nothing is wrong. If the worms are trying to escape in large numbers, it may mean that something is wrong with the conditions in the bin. Solutions:

- check to see if anything improper has been added or if something has spilled into the bin
- take the lid off, let the bedding dry out a bit , and let the light shine in to encourage the worms to stay put
- add crushed egg shells to reduce the acid level in the bin
- mix more shredded newspaper into the bin (the worms may be lacking air space).
- If the bin is very dry, moisten the bedding until it is slightly damp.

RESOURCES:

The book, *Worms Eat My Garbage* (1982 & 1997) by Mary Appelhof, Flower Press, Kalamazoo, MI is very thorough and gives you all the information you need to use worms in composting. It can be ordered at book stores or found in the library.

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For more information about vermicomposting contact:

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