VERMICOMPOSTING

What is vermicomposting?

Vermi is a Latin word meaning worm. Vermicomposting is a way of making compost with the help of a special kind of worm that can eat and expel close to its own weight every day. The worms don't perform this feat on their own; they work in partnership with microbes such as bacteria that help the breakdown process. The worms need to be kept warm, so vermicomposting is usually done indoors on the Canadian prairies. Vermicomposting is used to process food scraps in homes, schools and offices. People often come to think of their worms as helpful pets.

What is vermicompost?

Vermicompost is mostly worm castings. Fortunately, the faint earthy smell of the worm 'poop' doesn't cause any odour problems. 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.

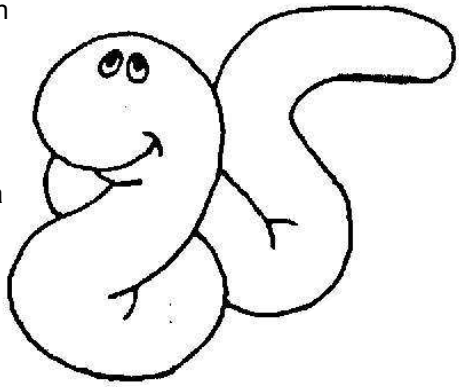
Composting vs. Vermicomposting

Feature	Backyard Composting	Vermicomposting
Active 'workers'	Bacteria, fungi	Worms, bacteria, fungi
Compost Materials	Leaves, food scraps, grass clippings, plant stalks, etc.	Food scraps, bedding material
Pile size	At least 1 m x 1 m x 1 m; Encourages heating phase	15-20 cm (6-8") layer; Avoids heating phase
Temperature	Microbes active over a wide range, go dormant in winter	Worms prefer 16-27°C Freezing kills worms and eggs
Care	Requires sporadic care; inactive piles can be revived	Requires consistent low level care; dead worms have to be replaced
Advantages	Handles lots of materials, modest care requirements	Allows indoor composting; compost has slightly higher fertility value

The worms

It takes a special worm to thrive in the 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 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. In worm bins, they take to eating food scraps with enthusiasm, and can process a large amount daily. 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. There are also a variety of other "associates", both microscopic and visible, who take up residence in the worm bin. 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.

Where to get worms

Look first for people you know who are already vermicomposting. They will have extra worms periodically that they can share.

The Saskatchewan Waste Reduction Council keeps a list of active vermicomposters who sometimes have worms available for sale. Check out our website at **http://www.saskwastereduction.ca/resources/Composting/vermicomposting.html** or call us at 306-931-3242 or email us at info@saskwastereduction.ca for more information.

Getting started

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 has not been used to store chemicals, such as pesticides, which may kill the worms.

Hardware stores carry excellent potential worm bins in the

What size of bin? How many worms?

For each 500 g (1 lb) of food waste produced each week, you will need at least 30 cm^2 (1 $ft.^2$) of bin space. If you produce lots of food scraps, you might choose to have several smaller bins rather than one large one.

# People	Bin Size	Quantity of Worms
1 to 2	45 x 60 x 30 cm (1.5' x 2' x 1')	~500 g (~1 lb)
2 to 3	60 x 60 x 30 cm (2' x 2' x 1')	~ 1 kg (~2 lbs)
4 to 6	60 x 105 x 30 cm (2' x 3.5' x 1')	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.

plastic housewares department. Look for shallow storage bins with strong lids. New plastic containers should be scrubbed well with detergent, then carefully rinsed.

The most important thing to remember in choosing a worm bin is that it should be shallow: 20 to 30 cm (8 -12") is good. Given bins of different shape but equal volume, the one with the greater surface area is preferable as it provides better aeration and more places to bury waste.

The worms need to live near the surface in order to breathe. Drill several 5 mm (1/4") holes in the lid and sides for air circulation.

Bedding

Worm bins are filled with "bedding" to provide the worms with a balanced diet as well as a damp, aerated home. The most desirable bedding is light and fluffy to allow air exchange. Common bedding materials include a combination of one or two of the following: newspaper, a small amount of garden soil (soil is added to the bedding mix to introduce microbes and add grit for the worms to use in their gizzard), corrugated cardboard, coarse sawdust and peat moss. 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 moisten by soaking it in water for several minutes. Squeeze out the excess water before adding this bedding material to the worm bin.

All bedding should be kept as moist as a wrung-out sponge—not soggy, and not dry. Adding food to the bin also adds moisture. If you are using a plastic bin like the one described previously, usually the lid needs to be left ajar to let some moisture escape. Wooden bins tend to be drier, so keep the lid closed and check to make sure the bedding stays moist.

The food

The worms need a steady supply of food to survive.

Recommended foods

Most kitchen scraps, including:

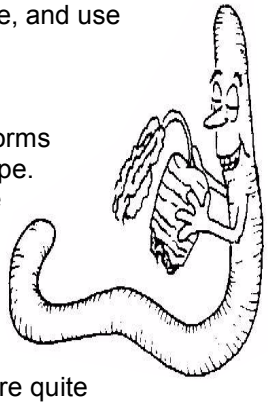
- coffee grounds/filters, tea bags
- vegetable and fruit peelings
- egg shells
- pizza crust, spaghetti, corn flakes, bread, beans, etc.

Foods to be avoided

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

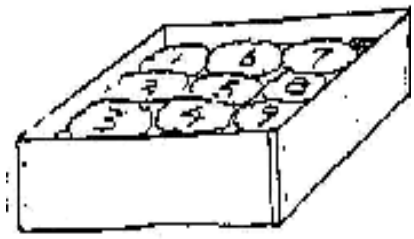
One way to feed worms is to bury the food scraps when you are cleaning up the kitchen. This way you have a good chance of avoiding pest and odour problems. The worm-microbe team can compost fresh food much more quickly if it is chopped with a knife or buzzed in a food processor. The more finely the food is chopped, the more water it releases. If you use a food processor make certain that there is enough bedding or ventilation to deal with the added moisture.

Another way is to keep a lidded plastic container next to the sink and collect all the organic waste that will eventually be fed to the worms. Keep the container covered to avoid fruit flies. Two to three times a week, empty the contents of the container into the worm bin. Make sure to cover this partially rotted food with at least 3 cm (1") of bedding material. The food disappears more

quickly with this method as the worms prefer to eat partially decomposed food.

Worms need to be fed regularly so that their population remains healthy and grows.

A nine-spot system works well when burying food waste:



If you bury your food scraps about twice a week, you won't have to dig into a region that has had food waste placed there for about one month. By then, much of it is no longer recognizable, having been consumed by the worms, or having broken down by other natural decomposition processes caused by worm associates in the box.

Bury the newly deposited waste with 3 cm (1") or so of bedding, and replace the lid on top of the bin to retain moisture. The whole process should take about two minutes.

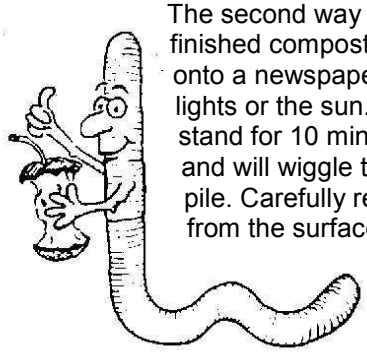
The temperature

Red wigglers will survive in temperatures from 5 to 32°C (40 - 90°F), but the ideal temperature for them is between 16 to 27°C (60 - 80°F). If you keep the worms on your balcony and the temperature drops below 5°C (40°F), be sure to bring your vermicomposter indoors.

Harvesting the compost and the worms

In 3 to 6 months, the worms will have consumed most of the bedding, and the vermicompost (worm castings) will need to be harvested.

There are two 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. Then only bury food on the new side. In six weeks, the worms will have migrated to the new bedding and you can harvest the finished compost, and replace it with new bedding.



The second way to separate worms from finished compost is to put the contents of the bin onto a newspaper or plastic sheet under bright lights or the sun. Make small piles and let them stand for 10 minutes. The worms hate the light and will wiggle to the centre and 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 piles and are easy to harvest. Return the worms to their bin with fresh bedding and some food waste. Store castings in a jar or pail for later use.

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. We suggest wearing gloves and gently removing the worms.

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 can also help 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.
- Make your own potting mix with equal parts vermicompost, peat moss, perlite and garden soil.
- Mix with commercial potting soil: one part vermicompost to three parts potting soil
- Add a thin layer (0.5 cm or 1/8") to the soil surface of potted plants every two to three months
- Make a simple compost tea for houseplants by putting 250 ml (½ cup) of vermicompost in a plastic mesh bag and placing it in a small pail with 2 L (2 quarts) of cool rain or decholorinated water (let tap water sit uncovered for several hours). 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

Mould

Moulds are an active part of the vermicomposting process. The moulds help break down the food and then the worms eat the mould and softened food. If there are people in your family or classroom that are sensitive to moulds, they

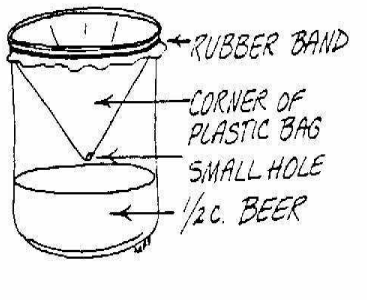
should avoid tending the vermicomposting system. If extreme mould sensitivities are a concern you may want to try other composting methods.

Fruit Flies
Worm composting bins are relatively trouble-free. The most common problem people have with them is small flies. Fruit flies are small flies with colourful eyes. They can be kept to a minimum by fully covering fresh food wastes with a few inches of bedding. If fruit flies persist, you may want to make yourself a fruit-fly trap to put beside the vermicomposting bin.

Fruit fly trap
You'll need a jar, a plastic bag, a rubber band, and beer.

To make the trap, pour 125 ml (1/2 c) of beer into a jar. Place the plastic bag over the mouth of the jar with one corner reaching down into the jar.

Poke a small (no more than 5 ml [1/4"] diameter) hole in the corner of the bag with a pencil. Secure the bag around the rim with the rubber band. Fruit flies, attracted by the fermenting beer, find their way through the tiny hole and can't get out. Voila!

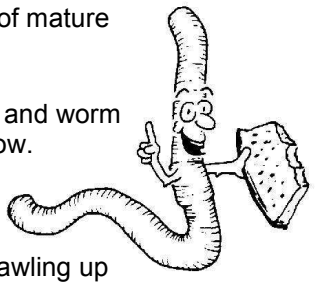


Fungus Gnats
If you have small dark flies in your compost bin with no taste for beer, you have the other common type of vermicompost pest. Fungus gnats eat fungi and are not attracted to beer. Here are some control measures that can help:

- place a 2 cm (1") layer of dry newsprint strips on top of the bedding
- leave the lid ajar to allow excess moisture to evaporate
- place some yellow sticky traps (such as Safer's Sticky Stiks) on or near the bin to attract and trap the adults.

Bad smells
Bad smells in a worm bin can result from either too much food waste, too much moisture, or the presence of cheese or other animal products. Odors can be controlled by:

- removing excess food wastes
- taking the lid off and letting the bedding dry out if it is too moist
- adding a few tablespoons of pulverized dried egg shells
- adding a couple of handfuls of mature compost or soil
- adding fresh bedding
- loosening up dense bedding and worm castings to allow better air flow.



Worms crawling up the sides of the bin
If worms are trying to escape (crawling up the sides of the bin), it means that the bin conditions are not ideal or that the food waste may be toxic to the worms. Solutions:

- take the lid off and let the bedding dry out a bit
- add crushed egg shells to reduce the acid level in the bin
- mix shredded newspaper in with the bedding (the worms may be lacking air space).
- moisten dry bedding so 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.

For more information about vermicomposting, contact:
Saskatchewan Waste Reduction Council
#208—220—20th St. W.
Saskatoon, SK S7M 0W9

tel (306) 931-3242
info@saskwastereduction.ca
www.saskwastereduction.ca

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