

# Hot Composting

Hot composting is a process of rapid decomposition that takes place at high temperatures. This decomposition is performed mostly by bacteria adapted to working at high temperatures in order to break down organic materials quickly and efficiently. Hot composting allows for faster production of larger amounts of compost - well-managed piles can take as little as 3 months to be garden-ready!

## Effort Scale:

|      |   |   |   |   |   |      |  |
|------|---|---|---|---|---|------|--|
| Easy | 1 | 2 | 3 | 4 | 5 | Hard | Involves building the pile all at once, then monitoring the temperature and moisture, flipping when appropriate and harvesting the finished compost. |
|      |   |   |   |   |   |      |  |

## How Do I Hot Compost?

Hot composting works well in a 2 or 3-bin system (see photo). Simply gather your carbon and nitrogen-rich materials and alternately layer them in your bin. Stick a compost thermometer into the middle of the pile once finished. Check the temperature of your pile daily and when it reaches 55-60°C it is time to flip it into the second bin. The pile will heat up again, monitor the temperature to determine when to flip it a second time. After the second flip, allow it to cure for at least another 6 weeks. Read on for more detailed instructions!

## Why Hot Compost?

- Produces a microbe-rich, full-spectrum nutrient source for your garden
- Creates compost quickly. Hot compost piles can be finished in as little as 3 months.
- Kills weeds and seeds. If managed properly, the high temperature of a hot compost pile can effectively kill most weeds and seeds.
- Composts larger amounts of material than in a passive compost system (such as the Earth Machine). For example, yard and garden waste from a small farm or large backyard can be handled by a 3-bin system.
- Creates a larger amount of finished compost than that produced in a passive compost system. This can then be used to build soil more quickly in a new garden space

## Types of Bins

The most common bin used for hot composting is made from re-purposed pallets, but a 3-bin can be made from any other materials that work.

The elements of an effective hot composting bin system include:

- Removable front slats for easy access
- Inside lined with 1/4" mesh to keep out rodents
- 2-3 compartments for turning piles
- Volume of each compartment = at least one cubic meter
- A lid to keep out rodents and rain
- Wood treated with organic preservative (optional)



*The bin pictured makes good use of recycled materials (pallets) and is easy to construct. For plans on how to build one of these 3-bins, contact the Compost Education Centre.*

## A Note on Volume/Critical Mass

A hot compost pile should be **no smaller than one cubic meter** in order to reach and maintain temperatures for hot composting (55°C). This size of pile, or larger, ensures that there is enough insulation on the outside of the pile to keep the inside hot. The outside 6-10" of the pile is mostly for insulation, while the main activity of decomposition takes place in the middle of the pile.

# Creating Your Hot Compost Pile

## 1. Types, Size and Diversity of Materials

Once you have built your bin, it is time to gather materials to make your hot compost pile. The types of materials you use have a direct relation to the amount of heat generated in the pile, the size of the materials influences how fast the pile will decompose and the diversity of materials influences the quality of the finished product.

### a) Carbon (Browns) and Nitrogen (Greens)

All organic materials contain both carbon and nitrogen. However, materials have different proportions of these two elements. Materials that are high in carbon are called "browns" and materials that are high in nitrogen are called "greens".

| Greens   | Browns   |
|--|--|
| <ul style="list-style-type: none"> <li>Fruit and veggie scraps</li> <li>Fresh grass clippings</li> <li>Fresh weeds and plants</li> <li>Fresh animal manure (horse, chicken, cow)</li> <li>Eggshells</li> </ul> | <ul style="list-style-type: none"> <li>Fallen leaves</li> <li>Straw</li> <li>Chipped woody debris</li> <li>Shredded newspaper</li> <li>Sawdust</li> <li>Dry grass clippings</li> </ul> |

In the summer, nitrogen materials are plentiful and brown materials can be hard to find. Therefore, it is a good idea to collect and stockpile leaves in the fall and winter as they fall from the trees. These can be stored in a homemade hoop bin (see Fact Sheet #6 - Urban Leaves) and accessed as needed.

### b) Surface Area

Material that is smaller in size will break down much quicker than large pieces. Finely chopping or chipping organic material breaks up any tough protective layers and creates more spaces where microorganisms can do the work of digesting and breaking down that material. You can cut up materials using a variety of methods, including using a leaf shredder or chipper, hand pruners, running over leaves with a lawnmower or putting leaves in a large plastic garbage can and whipper snipping them (remember to use proper eye protection!).

### c) Diversity

Using a diversity of materials will yield compost with rich nutrient qualities. Some plants, called *dynamic accumulators*, contain specific micronutrients and minerals that aren't commonly found in your typical garden waste. These can be added to your compost to enrich its nutrient content.

## Common Dynamic Accumulators:

| Dynamic Accumulator            | Macro/Micronutrients/Minerals                                     |
|--------------------------------|---|
| Comfrey                        | Nitrogen, potassium, calcium, magnesium, potassium, silicon, iron |
| Stinging Nettles               | Nitrogen, potassium, calcium, sulfur, iron, copper                |
| Chickweed                      | Phosphorous, potassium, manganese                                 |
| Cleavers                       | Calcium   |
| Dandelion (leaves and flowers) | Phosphorous, potassium, calcium, magnesium, iron, copper, silicon |
| Mullein                        | Potassium, sulfur, magnesium, iron                                |

## 2. Layering Materials

To start the hot compost pile, use rough material like twigs, straw, or coarse plant material like sunflower stalks. This allows air to access to the bottom of the pile (see section 4. Air and Ventilation).

As a general rule, when layering your hot compost up, you should use alternating brown and green layers of equal thickness (4-6"). Keep in mind that some materials are *very high* in nitrogen (grass clippings and chicken manure) or carbon (sawdust and wood chips) so you will need to adjust your mix accordingly.



You can mix each carbon/nitrogen layer to ensure that the materials will interact as much as possible with each other.

Add water to the pile as you build it - you're shooting for a moisture content similar to that of a wrung out sponge. Rainwater is the best water source as it doesn't contain chemicals that will harm the microorganisms you are trying to breed (see section 3. Moisture).

It is a good idea to always finish your hot compost with a layer of browns. This helps to minimize potential odours and flies. Pop your compost thermometer in and close the lid of your bin to prevent it from becoming water logged in the wet months and from drying out too much in the summer.

### 3. Moisture

Moisture is important in a compost pile for two reasons:

1. It helps soften organic materials
2. It provides microorganisms with a healthy living environment

Microorganisms produce the heat in your pile by creating chemical reactions while they decompose organic matter. Many of them breathe through their skins and require a moist environment in order to not dry out and die (like our lungs are kept in a moist environment inside our bodies). On the other hand, if the pile is too wet, the microorganisms are just as susceptible to drowning. Therefore, you need to make sure your pile is **as wet as a wrung out sponge** so these little guys can do their work and make the pile heat up properly!

### 4. Air and Ventilation

Air provides microorganisms in your compost pile with the oxygen necessary for aerobic decomposition. To ensure your pile has adequate air flow:

- Don't use thick layers of material that is prone to matting down easily, such as grass clippings
- Use some rough materials in your compost pile, like sunflower stalks and small twigs
- Put a floor of rough materials at the bottom of your compost pile
- Mix each carbon/nitrogen layer as you build your pile

## Monitoring and Turning Your Compost Pile

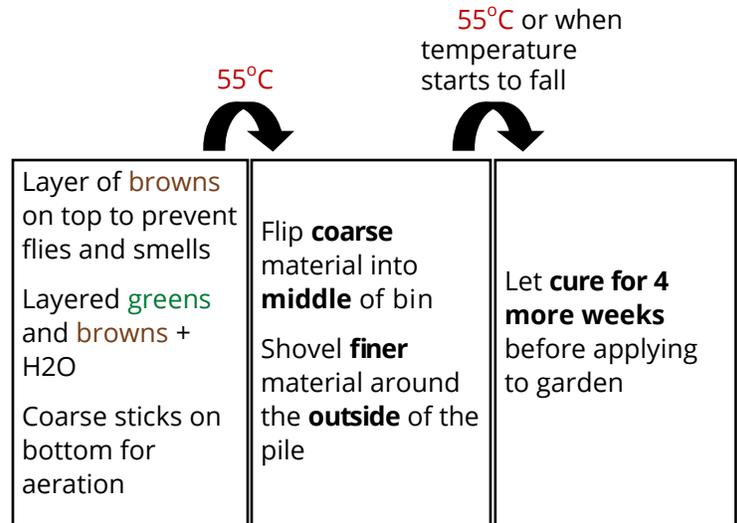
Once you have finished building your compost pile the decomposition process will begin. Check your thermometer at least once a day to make sure your pile is heating up and not surpassing the 55°C mark. If the pile gets too hot, beneficial microorganisms are at risk of dying. Therefore, once your pile hits 55°C, it is time to flip!

Using a garden fork, transfer the materials into the neighbouring bin. As you transfer the pile, try to get the materials from the outside of the first pile into the inside of the new pile. This will ensure the less decomposed materials are subjected to the higher temperatures at the centre of the pile that can kill weed seeds. Place your thermometer in the pile again.

Once you have turned the material into the second bin, it will heat up again, though it may not get as hot as in the beginning. Monitor the temperature, looking for the pile either reaching 55°C or peaking and then cooling down. When one of these things happens, it is time to flip the pile a last time.

Now it is time to let your pile "cure" for at least another 4 weeks. During this phase, the chemical reactions in the pile will stabilize, it will attract more microbial life and become richer in nutrients.

### Building and Flipping the Pile



## Harvesting Your Compost

The range of time a hot compost can take from beginning to end can be very wide—anywhere from 8 weeks to 6 months. How long it takes depends on how well-managed it is and the time of year. The heat of the summer sun can definitely speed up microbial activity, resulting in a faster process. If you follow what has been outlined in this factsheet, your hot compost should be finished in 8 weeks to 2 months, depending on the time of year.

Some other finished compost cues include:

#### Visual Cues:

- Majority of material is dark brown to black with no discernible materials
- Material has reduced to 60% of original size

#### Smell Cues:

- Pile has no trace of food scrap odours
- Material smells very earthy

#### Other Cues:

- Compost does not heat up anymore
- Material feels loose and crumbly



*A compost thermometer is an essential part of the hot composting process*

**Screening**

Finished compost is dark, crumbly and earthy smelling. It may have varying degrees of moisture, but should feel as wet as a wrung out sponge. There may be a few bits that have not completely decomposed, these can be screened out before you apply your compost to your garden soil. Screen your compost using 1/4" to 1/2" wire mesh (available at local hardware stores). A simple screen can be constructed by stapling the wire mesh to a frame built with 2x4's screwed together.

Two ways to use this screen are:

**Wheelbarrow method:**

- Place screen on top of wheelbarrow
- Put 2-3 shovelfuls of compost onto screen
- Sift the compost through the screen by swishing your hands back and forth across the screen



**Stand-up method:**

- Spread a tarp out
- Place the screen at a steep angle, either against a wall or using supporting legs, on top of the tarp
- Toss the compost through the screen. The small bits will fall through and the large bits will slide down to the bottom of the screen.



The "screenings", or larger bits, can be added to your next compost pile or can be used as mulch under your ornamental plants.

**Troubleshooting Your Hot Compost Pile**

| Problem   | Cause  | Solution  |
|---|--|---|
| Pile won't heat up  | <ul style="list-style-type: none"> <li>● Not enough nitrogen ("greens")</li> <li>● Not wet enough</li> <li>● Not big enough</li> </ul> | <ul style="list-style-type: none"> <li>● Rebuild pile adding more green materials like manure, fresh nettles and comfrey, coffee grounds</li> <li>● Check moisture by digging into middle with hand, water thoroughly</li> <li>● Rebuild pile until at least one cubic meter in size</li> </ul> |
| Pile smells strongly of ammonia or rotting plant material | <ul style="list-style-type: none"> <li>● Too much nitrogen, not enough carbon</li> <li>● Pile too wet</li> </ul>                       | <ul style="list-style-type: none"> <li>● Rebuild pile with more brown material</li> </ul>   |
| Flies   | Fruit and veggie scraps lying on top of pile   | Cover top of pile with a layer of brown material like dried leaves or grass   |



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