



HOMEMADE COMPOST

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Abstract

Composting has been used as a means of recycling organic matter back into the soil to improve soil structure and fertility. The composting process has received much attention in recent years because of pollution concerns and the search for environmentally sound methods for treating waste. Waste volumes continue to rise, which leads to loss of resources and increased environmental risks. Open dumping and sanitary landfill is a major method for waste disposal, the Land filling of biodegradable waste is proven to contribute to environmental degradation, mainly through the production of highly polluting leachate and methane gas .Composting aims to stabilization of waste for land filling , volume and mass reduction of solid waste and return of organic substances to the natural cycle .This paper reviews information on the composting for treating waste as a means of addressing the environmental pollution concerns.

Keywords: Composting, Environmental pollution and Land filling

Introduction

Home composting is the process of using household waste to make compost at home. Composting is the biological decomposition of organic waste by recycling food and other organic materials into compost. Home composting can be practiced within households for various environmental advantages, such as increasing soil fertility, reduce landfill and methane contribution and limit food waste. While composting was cultivated during the Neolithi Age in Scotland, home composting experienced a much later start. Indoor composting, also known as home composting, was discovered in 1905 by Albert Howard who went on to develop the practice for the next 30 years. J.I. Rodale, considered the pioneer of the organic method in America, continued Howard's work and further developed indoor composting from 1942 on. Since then, various methods of composting have been adapted. Indoor composting aided in organic gardening and farming and the development of modern composting. It originally entailed a layering method, where materials are stacked in alternating layers and the stack is turned at least twice.

Why composting?

Composting is a controlled , aerobic (oxygen- required) process that converts organic materials into a nutrient – rich soil amendment or mulch through natural decomposition. The end product is compost –a dark ,crumbly ,earthy-smelling material. Microorganisms feed on the materials added to the compost pile during the

composting process. They use carbon and nitrogen to grow and reproduce, water to digest materials and oxygen to breathe.

1. Healthier plants.
2. Composting saves your money.
3. Composting is practical and convenient.
4. Composting is a good alternative to land filling.

Compost application to agriculture soil

Composting helps to optimize nutrient management and the land application of compost may contribute to combat soil organic matter decline and soil erosion. Compost land application completes a circle whereby nutrients and organic matter which have been removed in the harvested produce are replaced. The recycling of compost to land is considered as a way of maintaining or restoring the quality of soils, mainly because of the fertilizing or improving properties of the organic matter contained in them. Furthermore, it may contribute to the carbon sequestration and may partially replace peat and fertilizers. Compost application to agricultural land needs to be carried out in a manner that ensures sustainable development. Management systems have to be developed to enable to maximize agronomics benefit, whilst ensuring the protection of environmental quality. The main determinant for efficient agronomics use is nitrogen availability, high nitrogen utilization in agriculture from mineral fertilizers is well established and understood, whereas increasing the nitrogen use efficiency of organic fertilizers requires further investigation.

The Composting Process

Composting of agricultural waste and municipal solid waste has a long history and is commonly employed to recycle organic matter back into the soil to maintain soil fertility. The recent increased interest in composting however has arisen because of the need for environmentally sound waste treatment technologies. Composting is seen as an environmentally acceptable method of waste treatment. It is an aerobic biological process which uses naturally occurring microorganisms to convert biodegradable organic matter into a humus like product. The process destroys pathogens, converts N from unstable ammonia to stable organic forms, reduces the volume of waste and improves the nature of the waste. It also makes waste easier to handle and transport and often allows for higher application rates because of the more stable, slow release, nature of the N in compost. The effectiveness of the composting process is influenced by factors such as temperature, oxygen supply (i.e. aeration) and moisture content. There are two fundamental types of composting aerobic and anaerobic.

- **Aerobic**

Composting is the decomposition of organic wastes in the presence of oxygen (air); products from this process include CO₂, NH₃, water and heat. This can be used to treat any type of organic waste but, effective composting requires the right blend of ingredients and conditions. These include moisture contents of around 60-70% and carbon to nitrogen ratios (C/N) of 30/1. Any significant variation inhibits the degradation process. Generally wood and paper provide a significant source of carbon while sewage sludge and food waste provide nitrogen. To ensure an adequate supply of oxygen throughout, ventilation of the waste, either forced or passive is essential.

- **Anaerobic**

Composting is the decomposition of organic wastes in the absence of O₂, the products being methane (CH₄), CO₂, NH₃ and trace amounts of other gases and organic acids. Anaerobic composting was traditionally used to compost animal manure and human sewage sludge, but recently it has become more common for some municipal solid waste (MSW) and green waste to be treated in this way.

Organic waste



Home composting pile with added kitchen waste

There are various types of organic waste that can be used to compost at home. Composting requires two types of organic materials: "green" waste and "brown" waste. This is due to organic waste requiring four elements to decompose: nitrogen, carbon, oxygen, and water. A proper carbon-to-nitrogen ratio must be maintained along with proper oxygen and water levels in order to create compost. An effective ratio is 25-30 parts carbon to 1 part nitrogen.

All compostable material has carbon, but have different levels of nitrogen. Greens have a lower carbon-to-nitrogen ratio. Greens refer to leafy or fresh organic ingredients and are generally wet. Browns are richer in carbon and are generally dry ingredients. Too much carbon will result in a drier compost pile that will take more time to decompose while too much nitrogen will result in a more moist, slimy, and pungent pile. To obtain an effective ratio for decomposition, include two to four parts brown compost to one part green compost in the pile.

What to Compost at Home

Greens	Browns
Fresh grass clippings/leaves	Dead leaves
Fruits and vegetables	Branches
Fruit and vegetable peels and rinds	Twigs
Food scraps	Nut shells (except walnuts)
Cooked rice/pasta	Paper (stationary, newspaper, toilet paper, napkins, etc.)
Stale bread	Plain cardboard (not glossy)

Egg shells	Paper egg cartons
Coffee grounds	Used paper coffee filters
Tea bags	Lint
Hair, fur, and nail clippings	Pet bedding (from hamsters and such)

What Not to Compost at Home

Materials	Reason
Meat or fish (including bones)	Creates odor and attracts pests
Dairy products (eggs, milk butter, etc.)	Creates odor and attracts pests
Fats and oils	Creates odor and attracts pests
Pet feces	Might have harmful parasites, bacteria, viruses, etc. to humans
Coal ash	Might have harmful substances to plants
Yard trimmings with pesticides	Might have harmful substances to plants

Implementation



Closed bin home composting using a polystyrene box

Step 1: Set Up Bin

The first step of composting at home is to secure a composting bin and location.

- **Bin Type** - Composting indoors usually calls for a **closed bin method** while composting outside in the garden or yard allows for the open bin method without a cover. Compost bins can be purchased online but various alternatives for closed compost bins are old wooden dressers, garbage cans, wine crates, and more while open compost bins can be made using wooden posts, metal stakes, and wire mesh.
- **Bin Size** - Bin size can range from 5 gallon bins for a small household to 18 gallons for a large household. A **3 x 3 x 3 foot** container will also suffice.
- **Drainage** - Bins need ample **drainage** and may require holes to be drilled at the bottom.
- **Location** - Whether **indoor or outdoor**, locating the bin in a dry and shady spot is suggested.



Open bin home composting

Securing an additional smaller compost bin to collect **food scraps** is recommended if the primary bin is further from the main area where compost materials are frequently produced. This will avoid the inconvenience of constantly moving to the location of the **main compost bin**.

Step 2: Gather Materials

The next step to home composting is to **gather materials for the compost layers**. Most items available in a household include various food scraps, coffee grounds, tea bags, shredded paper, and more. To maintain a proper carbon-to-nitrogen ratio, collect approximately two to four parts of brown compost matter to one part green compost matter. Breaking down ingredients before adding them to the compost pile will allow them to **decompose more easily and quickly**.

Step 3: Add to Bin

There are various methods of composting but the suggested method at home involves aerobic composting with worms (**vermicomposting**) or without worms.

Layering

Home composting can be completed through a layering process. Start with a layer of coarse ingredients to allow for airflow, then alternate with layers of nitrogen-rich (greens) and carbon-rich materials (browns), and mix together. Bury food scraps in the center of the pile and add soil on top for every few layers.



Vermicomposting using red wigglers

Vermicomposting

To vermicompost, approximately one pound of worms can be added to the top of the soil layer but will need ample bedding (newspaper, shredded paper, etc.). Red **wiggler worms** (*Eisenia fetida*) are suggested as they are able to eat half their body weight in one day. Vermicomposting can take place indoors or outdoors. However, it is recommended to keep the worm bin indoors since worms can die from extreme temperatures. **Vermicomposting** is faster (2–3 months) than no-worm composting (3–9 months), involves minimal maintenance, limits odor, and provides multiple nutrients to the soil.

Step 4: Aftercare



Composter with rolling design for easy turning

Maintenance

Regardless of the method used, a proportionally small amount of water may need to be added to the pile when dry to ensure proper moisture content. Composting without worms will require turning the pile every few weeks to guarantee **proper aeration**. The more often it is turned, the faster the compost will decompose. **Vermicomposting** does not require turning.

Usage

Compost is finished if the material is dark, crumbly, smells earthy, and contains no added scraps. Finished compost can be used in a multitude of ways such as for **mulch, amending soil, fertilizer, and compost tea**.

Methods of Using Compost

Use	Instruction
Mulch	Apply a 3-6 inch layer to the bed and rake.
Amend Soil	Mix 1–2 inches of the compost into the top 3–5 inches of the soil. This can also be done before adding plants or seeds to aerate the soil and add nutrients.
Fertilizer	Add 1-2 inches of compost to grass or plant pots and rake or mix.
Compost Tea (liquid fertilizer)	Steep the compost in water for a few days, strain, and use it to water or mist plants.

Environmental benefits

Increase Soil Health:

Home composting will **promote soil health biologically, chemically, and structurally**. It contains three major nutrients (nitrogen, phosphorus, and potassium) as well as other elements like calcium, iron, magnesium, and zinc that assist in soil and plant health. It works as a natural and organic fertilizer as opposed to using synthetic fertilizers with harmful chemicals. Home compost is also able to improve soil water retention, capacity, and productivity. It provides beneficial microbes that increase nutrients and humus formation in the soil. Humus acts like a glue agent and binds soil together, which helps prevent soil erosion.

Reduce Greenhouse Gas Emissions:



Landfill located in Perth, West Australia

One benefit of aerobic home composting is the **reduction in methane emissions**, one of the most threatening greenhouse gases to the environment. **Food waste and packaging** are responsible for 70% of household waste that resides in landfills. Over 95% of food waste ends up at landfills where it produces methane, carbon dioxide, and other greenhouse gases through anaerobic digestion. These greenhouse

gases trap heat within the atmosphere and further contribute to climate change. It is predicted that by 2050, global greenhouse gas emissions will increase by 80% from food production alone. Home composting can limit landfill waste and therefore, methane emissions as well.

When food waste is thrown out and ends up in waterways, it can contribute to algae blooms. Algae blooms can produce toxic emissions that have harmful health effects on mammals and organisms, including humans. **Eutrophication**, or extreme nutrient levels, leads to dense algae bloom formation which can damage drinking water and develop “**dead zones**” that harm marine life. Algae blooms also heavily contribute to global methane emissions.

Greenhouse gases are emitted in the manufacturing of synthetic fertilizers so by using organic compost material to fertilize home gardens instead, these emissions will be reduced. By limiting the amount of food waste that ends up in landfills and using homemade fertilizer through home composting, **households will reduce their carbon footprint.**



42.4 kg of avoidable food waste found in New Zealand household rubbish bins in 2014

Reduce Waste:

Food waste contributes to the hunger crisis, in which **690 million people** in the world are under nourished and households are the reason behind a significant fraction of food waste. A food chain waste study of Melbourne demonstrated that 40% of waste occurs post-consumer. This adds to the wastage of energy, emissions, and cost of production and supply. Almost an equal amount of food that is produced is disposed of (approximately 40%). **The U.S Department of Agriculture** estimates that approximately 133 billion pounds and \$161 billion worth of food were wasted in 2010 alone. Home composting can limit the amount of waste contributed by households since it will not be disposed of but instead be used productively.

Marketing

A key to the success of a composting operation is a marketing or distribution program for compost products. To develop long term markets, the products must be of consistently high quality. Other essential marketing factors include planning, knowledge about end users, following basic marketing principles and overcoming possible regulatory barriers and product stigma. Compost characteristics desired by end users vary with intended uses, but most compost users look for the following elements (in order of importance):

- **Quality** (moisture, odor, feel, particle size, stability, nutrient concentration, product consistency, and a lack of weed seeds, phototoxic compounds and other contaminants).
- **Price** (should be competitive with other composts, although high quality and performance can justify a higher price).
- **Appearance** (uniform texture, relatively dry, earthy color).
- **Information** (product s benefits, nutrient and pH analysis, and application rates and procedures).
- **Reliable Supply.**

Conclusion

Composting is an environmentally friendly method rather than directly dumped into earth and it method is useful to convert organic waste to useful products and that would otherwise have been land filled. Compost has a lot of benefits like: reduce landfill space, reduce surface and groundwater contamination, reduce methane emissions, reduce transportation costs , reduce air pollution from burning waste, provide more flexible overall waste management, enhance recycling of materials and can be carried out with little capital and operating costs(Home Composting).

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