



## Garbage to Garden-Benefits of Bio-waste Home Composting

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### Abstract:

*This study conducted at Department of Life Sciences at KC College, HSNC University, Mumbai, addressed the issue of waste management of green waste by using the method of composting. This model of generating compost using the bio waste was extrapolated to kitchen waste at home. Home composting has been a preventive option for managing bio waste at local levels as it is a safer and organic way to dispose of the waste. The compost thus generated in 20 days was granulated and odorless. It helped in reducing the waste and also produced a bio fertilizer which was used for the plants in our laboratory as well as home. The plants treated with this compost showed healthier and faster growth than the untreated plants. The results obtained can be used for exploring other bio-waste material that can be used for composting.*

**Key Words:** Waste management, home composting, green waste, bio-fertilizer

### Introduction:

Composting is nature's way of recycling and is one of the simplest ways to manage waste. The other advantages are that apart from building healthy soil, composting also nurtures healthy plant growth. It puts an end to the need of using chemical fertilizers in the garden. Food scraps and garden waste together, currently make up more than 30 percent of what we throw away, and could be composted instead. Making compost keeps these materials out of landfills where they take up space and release methane, a potent greenhouse gas (Epstein 1997). The hands-on training received by the students of the Life sciences department at K.C. college helped them to learn the technique of bio-composting. They created a Compost bin first in the laboratory and then created similar bin at home. Due to the pandemic, visiting college was not possible, and hence the students carried out the process of making the green compost at their homes with the bio-waste materials available in their kitchens.

### Methodology:

Collection of biodegradable waste materials from the lab (at college) and home

1. Leaf Litter/Foliage – 500gms
2. Vegetable and Fruit Peels - 1cup
3. Egg shells - 3-4 in qty
4. Coconut coir - 1 in qty



5. Soil - 3-5 cups
6. Cardboard Box – 1 (Shoe box)
7. Cow dung or Manure – 2 cups
8. Water - enough to keep the mixture moist

#### *Procedure for making the Compost bin*

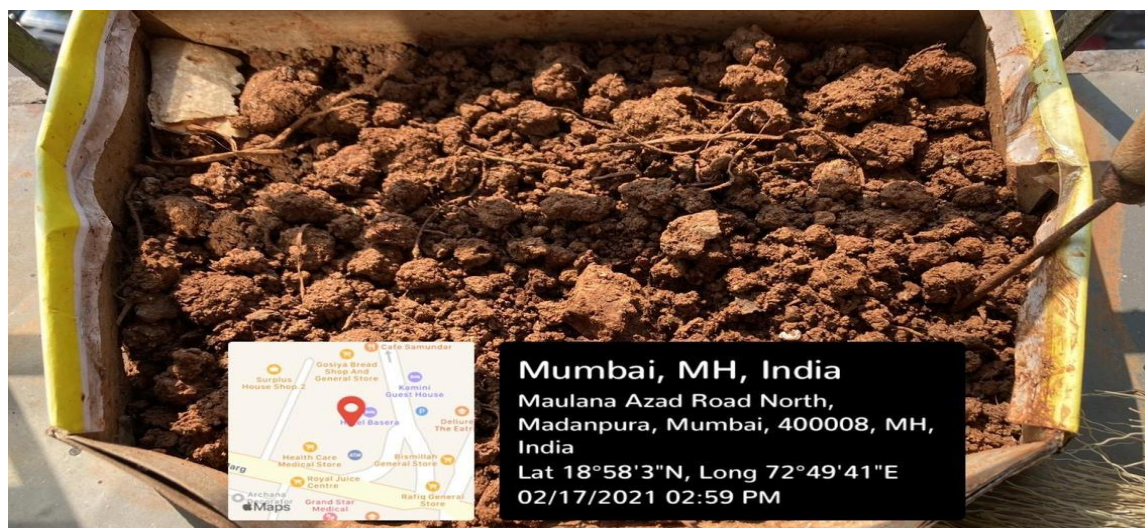
A cardboard box was used as a container for making the compost. 3-4 holes were made at the base to allow excess seepage of water. Few holes were made on the walls of the box so that air would pass easily. The bottom of the box was layered with soil thoroughly. A tray was kept below the box so as to prevent any spills. Further, a layer of bio waste was added to the soil. Food scraps, coconut coir, etc. Following with a few dry leaves, scraps of paper and dry husk or newspaper shreds in between to have an equal ratio between wet and dry waste. For instance, 1 cup of food scrap to 1 cup of dry waste. Next layer included cow dung or manure to speed up the process of composting.

The last layer of compost was of garden soil to cover the compost. The mixture was turned every 2 days a week to provide enough aeration for the waste to decompose successfully. The box was kept in the balcony, where it received maximum sunlight.

Water was sprinkled eventually for moistness and to speed up the process of composting every 6 hrs./day. The box was monitored accordingly. Every week, a cup of new soil was added to the mixture for making the compost healthy and nourishing. Within 3-5 weeks, results were obtained and a green compost was ready to be used. Rich in nutrients and smelling of earth.



*Figure 1- Day 1 of composting: kitchen waste observed*



*Fig 2 - Day 22 of composting: ready to use*

### **Significance of Composting:**

Composting is an environmentally-friendly technique for the management of manure (Neugebauer, Sołowiej & Piechocki, 2014). Some of the drawbacks stated by article- Organic remnants that are difficult to store, are unstable and are good constituents for composting, underlines the need for using it to prepare a biologically active compost. Manures, bio-solids and food leftovers are produced daily but often cannot be used on a daily basis and, therefore, must be stored intermittently. Composting modifies manures into to a drier, cleaner, uniform and biologically stable product with many uses other than just land application (Huhe, Jiang, Wu, Cheng & 2017). It is said that, Composting is one treatment process that converts manure or other organic residues into substances with greater utility and value. It can also reduce the need for chemical fertilizers (Vázquez, Plana, Pérez & Soto, 2020). In recent decades, the rapid increase in human population and advanced economy has caused an augmented increase in the waste generation rate. According to the literature cited, approximately 1,88,500 tons (68.8 million tons per year) of municipal solid waste is generated per day in urban India. However, only 24% of this humongous waste is processed, treated and disposed of, by suitable methods (Font, Artola & Sánchez 2011). Imagine, if we start composting in-situ at home, how much of kitchen waste can be utilized again as fresh compost that can augment our plants nutrition system. Truly proving the term, 'From Garbage to Garden'.

Composting enhances soil, helping retain moisture and reducing the incidents of infections to plants. It also stimulates the production of useful bacteria and fungi that break down organic matter to create Humus, a rich nutrient-filled material. In addition, compost reduces methane



emissions from landfills and lowers one's carbon footprint (Misra2003). Most importantly, you know what your plants are eating when it's homemade. Free of chemicals and harmful fertilizers, home composting has its own benefits.

### **Factors affecting Composting:**

Few factors that affect the process of composting can be pH, temperature, moisture, aeration, carbon to nitrogen ratio, microbial infection etc. The climatic conditions play a vital role in the process of making a compost, especially when it's on a larger scale and done in an open environment. For instance, a dull and gloomy day will surely slow down the process whereas on a brighter and sunny day, the process of decomposition speeds up.

According to a research article by Institute of Biosystems Engineering, Poznań University of Life Sciences, Poland, the distribution of organic matter occurring during composting causes a clear change in the structure and appearance of the material. Running the composting process of the same material under different conditions can affect the properties of the product obtained after a certain time. (Nsimbe, Mendoza, Wafula&Ndejjo2018). They conducted certain experiments on a larger scale, where they used certain chambers for making compost with sewage sludge, where temperature played a very crucial role. An apparent change in the appearance of the chamber when the temperature increased up to 45 degrees Celsius was observed which was attributed to the increased activity of aerobic bacteria that generate CO<sub>2</sub> as a product of the decomposition of organic matter (Sikora 1998).

**Table 1: Materials that can be composted or avoided.**

<b>What to compost</b>	<b>What to not compost and why?</b>
<ul style="list-style-type: none"> <li>• <b>Fruits and vegetables</b></li> <li>• <b>Eggshells</b></li> <li>• <b>Coffee grounds and filters</b></li> <li>• <b>Tea bags</b></li> <li>• <b>Nut shells</b></li> <li>• <b>Shredded newspaper</b></li> <li>• <b>Cardboard and paper</b></li> <li>• <b>Grass clippings</b></li> <li>• <b>Houseplants</b></li> <li>• <b>Hay and straw and Leaves</b></li> <li>• <b>Sawdust or Wood chips</b></li> <li>• <b>Cotton and Wool Rags</b></li> <li>• <b>Hair and fur</b></li> </ul>	<ul style="list-style-type: none"> <li>• Coal or charcoal ash - contains substances that might be harmful to plants.</li> <li>• Dairy products (e.g., butter, milk, sour cream, yogurt) and eggs - Create odor problems and attract pests such as rodents and flies.</li> <li>• Fats, grease, lard, or oils; Meat or fish bones and scraps - Create odor problems and attract pests such as rodents and flies.</li> <li>• Domestic wastes or pet feces - Might contain parasites, bacteria, germs, pathogens, and viruses harmful to humans. And cause plant diseases.</li> <li>• Meat scraps, bones and discarded fats - might smell and create odor issues, which will attract fleas, bugs, insects, etc.</li> <li>• Yard trimmings treated with chemical pesticides - Might kill</li> </ul>



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| • <b>Fireplace ashes</b> | beneficial composting organisms (EPA Gov 2021). |
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### **Precautions to be taken while making a Bio-Compost**

- Avoid using plastic, as it is non-biodegradable and takes years to degrade into water, carbon dioxide and biomass.
- Avoid excessive watering of composting material, as it will lead to sogging of the container (cardboard box).
- Cover the container/area used for the composting at all times to prevent flies and mosquitos buzzing over.
- Keep it in a dry place, preferably in contact with the sunlight.
- Turn the mixture every 2 days a week so as to prevent fungus and algae growth and also to speed up the composting process.
- Always maintain the required amount of moisture during composting.
- Avoid adding any fertilizers to speed up the process. This will change the pH of the compost and its properties which may make it unsuitable for use.

### **Conclusion:**

Composting is the highest form of recycling. An organic discarded material is converted into the compost can benefit the mankind (Kujawa, Janczak & Mazur, 2019; Esperón, Albero & Ugarte-Ruíz 2020). By segregating, recycling and composting, a family of 4 can reduce their waste from 1000 Kg to less than 100 kg every year (Rastogi, Nandal & Khosla 2020).

The materials used in the project at KC were biodegradable waste material obtained from the laboratory which makes the procurement of raw material easy. Since the process of composting was carried indoors, it taught the students of an easy way of producing useful material from waste material with minimal expenses or heavy instrument back up. The minimal requirement of instrument such as pH meter, that was used to check the pH of the ready product.

Through this pilot project participants benefited as follows:

- a. Hands-on training from the professionals helped the students at an undergraduate level to learn the science behind preparation of a compost from biological waste.
- b. The compost thus generated was further used for treating the plants and a noticeable difference was observed in the growth pattern of the plants, treated and untreated,



writhe height and number of leaves. The treated plants were healthy and showed faster growth, increased height and a greater number of leaves.

- c. Repeating the project at home, during pandemic times, kept the students engaged in a beneficial activity.
- d. Undergraduate students developed skills of planning and conducting a research project in a systematic manner.

### **Future Prospects:**

As the future prospect of this study, the quality of homemade compost would be checked for different abiotic and biotic parameters from the point of view of plant nutrition. A comparative study of effect of seasonal variation, w.r.t Mumbai weather, on the quality of compost will be carried out. It would also be followed by an awareness drive amongst the students of Junior college, schools in Mumbai and educational institutions in the rural districts, near Mumbai.

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