



## Kitchen Waste Composting

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### Abstract

Rapid industrialization and population explosion in India has led to the migration of people from villages to cities, which generate thousands of tons of Municipal Solid Waste (MSW) daily. Poor collection and inadequate transportation are responsible for the accumulation. Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. Food waste or food loss is food that is discarded or lost uneaten. Loss and wastage occurs on all steps in the food supply chain. In India, domestic waste is mostly of organic nature and contributes 70% to 80% of urban solid wastes. Food waste is organic in nature and decomposes quickly producing foul odours and attracts rodents and insects. Food waste drives MSW collection frequency, the major cost of MSW management. The management of different waste requires different kind of procedures to handle as the different toxic compounds that might be present in one may not be present in the other. But, many firms aims in utilizing all natural ways of handling the waste in a natural or eco-friendly manner, which can be also used for conversion of solid kitchen waste into compost by using compost solutions. Different composters are used for Kitchen waste composting.

**Keywords:** Kitchen waste composting, municipal solid waste, food waste, management of solid waste.

### Introduction

**Solid Waste:** The waste generated in solid state as a result of various human activities such as domestic, workplace, industries and normally discarded as useless or unwanted material are known as solid waste. Solid waste consists of highly heterogeneous mass of discarded materials from residential, commercial, industrial, agricultural and mining activities (like construction waste, household junk such as furniture appliances, equipments, etc). It may be categorized according to its origin, contents, or according to hazard potential. The management of MSW is going through a critical phase, due to the unavailability of suitable facilities to treat and dispose of the larger amount of MSW generated daily in metropolitan cities. Unscientific disposal causes an adverse impact on all components of the environment and human health<sup>1-7</sup>.

### Solid Waste Management

Waste disposal became problematic with the rise of towns and cities where large numbers of people started to congregate in relatively small areas in pursuit of livelihoods<sup>8</sup>. All this is contributed by the kitchen refuse, markets and slaughter house. These wastes have to be disposed off so that environment remains clean and healthy. Management of solid waste reduces or eliminates adverse impacts on the environment and human health. A number of processes are involved in effectively managing waste at process of generation, collection, storage, transport and disposal or reuse and re-circulation or incineration or any relevant method of disposal. A review of existing literature reveals, even prior to 1970, that a great number of studies on SWM have been undertaken<sup>9</sup>. In recent years,

increasing consumer concern about issues such as food quality, environmental safety and soil conservation has led to a substantial increase in the use of sustainable agricultural practices. The need to understand community participation and community-based environmental management initiatives have been addressed by researchers and concerned institutions<sup>10</sup>.

Several solid waste disposal methods are being used in the various parts of the world and the most prominent of these are discussed here briefly:

**Open dumping:** Method to storage or dump the solid waste in open area.

**Sanitary Landfilling:** A sanitary Landfill is defined as a land disposal site employing an engineered method of disposing of solid waste on the land in a manner that minimizes environmental hazards by spreading the solid waste to be smallest particle volume and by applying and compacting cover material at the end of each day. Important aspects in the implementation of sanitary landfills include Site selection, Land filling methods and operations, Decomposition of the landfill waste, Emission from the landfills, Leachate movement and its control.

**Incineration/ Combustion:** Much of solid waste is combustible, and the destruction of this fraction, coupled with energy recovery, is an option in solid waste management. Combustion is a chemical reaction where the elements in the fuel are oxidized. In waste-to-energy plants, the fuel is, of course, the solid waste. The major oxidisable elements in the

solid wastes are carbon and hydrogen. To a lesser extent, sulphur and nitrogen are present.

#### **Composting:**

#### **Vermicomposting:**

**Pyrolysis:** It is an alternate to incineration for volume reduction and partial disposal of solid waste. The word pyrolysis comes from two Greek words meaning 'fire' and 'breakdown'. Therefore pyrolysis is defined as breakdown by heat. Pyrolysis is an irreversible chemical change brought about by action of heat in an atmosphere devoid of oxygen.

Sanitary Landfilling is the main method used in the developed countries and open dumping is very common in India. There are various physical, chemical and microbiological methods of disposal but they are time consuming and need high cost and manual input. Many firms aim at utilizing all natural ways of handling the waste in a natural or eco-friendly manner by using different compost solutions popularly known as composters. Next section of this paper describes about kitchen waste.

**Kitchen Waste:** Household kitchen waste is one of the major sources of municipal solid waste. Food waste or food loss is food that is discarded or lost uneaten. Loss and wastage occurs on all steps in the food supply chain. In India, domestic waste is mostly of organic nature and contributes 70% to 80% of urban solid wastes. Food waste has a significant public health impact; it rots, smells bad, and attracts rodents and insects. Food waste drives Municipal Solid Waste (MSW) collection frequency, the major cost of MSW management. Landfilling adds an additional cost. It also generates greenhouse gases during decomposition, while the energy value and the soil nutrient value are lost when landfilling. Removing food waste from MSW has the potential to decrease greenhouse gas emissions, public health issues, MSW collection frequency and MSW management costs, increase renewable energy production, and provide nutrients to our soils. The management of different waste requires different kind of procedures to handle as the different toxic compounds that might be present in one may not be present in the other. A process related to composting which can improve the beneficial utilization of organic wastes is vermicomposting. It is a non-thermophilic process by which organic materials are converted by earthworms and microorganisms into rich soil amendments with greatly increased microbial activity and nutrient availability.

**Composting:** Composting is a biochemical process in which organic materials are biologically degraded, resulting in the production of organic by products and energy in the form of heat. Heat is trapped within the composting mass, leading to the phenomenon of self-heating that is characteristic of the process<sup>12</sup>. Food waste can be composted at home, avoiding central collection entirely, and many local authorities have schemes to provide subsidized composting bin systems. However, the

proportion of the population willing to dispose of their food waste in that way may be limited. A compost pile is an ideal way to recycle organic wastes from our home and community. If properly managed, a compost pile will kill pathogens and weed seeds. Compost will provide nutrients to the plants - not only nitrogen, potassium and phosphorus, but also the secondary and trace elements. Compost is a good way to improve the physical properties of the soil, such as drainage, aeration, ability to retain nutrients and water, both on sandy and clay soils. Composting provides an effective and environment friendly procedure of organic waste disposal since it is more economical and environment friendly. Moreover, in comparison with mineral fertilizers, compost produces significantly greater increases in soil organic carbon and some plant nutrients<sup>13-15</sup>. Degradation of each component of food waste is affected by environmental conditions<sup>16</sup>. Carbohydrate, cellulose, and protein have their own optimum pH and retention times for degradation<sup>17</sup>.

**Vermicomposting:** Preparation of the compost with the help of earthworms is known as vermicomposting, which is easily used to recycle waste which produces good quality compost. Earthworms consume biomass and secrete casts which is also known as worm cast or black gold. The casts are very nutritive and having growth promoting substances. These are also important for soil micro flora and can inhibit pathogenic bacteria. Vermicomposting is becoming popular in organic farming system. Worm casts secrete vermicompost which are rich in Calcium, Magnesium, Potassium, Nitrogen, useful microorganisms, hormones, enzymes and vitamins and certain micronutrients needed for plant growth<sup>18-19</sup>. *E.foetida* is the most common and favorable species of earthworms for vermicomposting of vegetable waste as they have high tolerance to environmental variables like pH, temperature and moisture. In many countries food waste is a big part of daily produced municipal wastes for an example the result of a study showed that Iran has a potential for production of 4 million tons compost from municipal solid wastes, annually. Nowadays, public understanding of vermicompost process increased and its deployment to convert organic waste into vermicompost has been increasingly expanded. The key to maximum productivity is maintenance of aerobic condition with optimum moisture and temperature<sup>20</sup>. In some cases, organic residues require pretreatment before being vermicomposted as they may contain substances that are toxic for earthworms, such as acidic compounds<sup>21</sup>. Depending upon the production and composting structures vermicomposting can be done on small as well as large scale.

#### **Why Kitchen Waste Composting**

i. The Kitchen waste contain organic as well as inorganic matter and offer good possibilities for recovery of energy in its organic fraction for gainful utilization through adoption of suitable processing and treatment technologies. ii. The total quantities of the generated waste get reduced. iii. The known suitable kitchen

waste which is mainly dumped in municipal waste can be converted into value added organic compost and vermicompost. iv. Kitchen waste composting to convert waste into a useful product for better growth and quality of crops. v. No chemicals are used in the production process. vi. Do not have any residual effect after application. vii. Contains locally harvested micro-organisms and is non-toxic to human beings. viii. It is very stable. ix. It acts as a soil conditioner. x. It reduces pathogenic bacteria. xi. It reduces toxicity which is caused by the heavy metals. xii. It is economical as well as environmentally safe method. xiii. It is a low cost technology.

## Conclusion

Food waste is organic in nature which decomposes quickly producing foul odours and attracts rodents and insects. Poor collection and inadequate transportation are responsible for the accumulation of waste. Management of solid waste reduces or eliminates adverse impacts on the environment, human health and supports economical development for the better quality of life. The paper highlights the various techniques to manage the kitchen waste and convert them into useful product for better growth and quality of crops.

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