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Composting of Food Waste and its Important Parameters

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Abstract

Composting is the process in which we controlled the process of decomposition and conversion of solid waste into humus-like material for further utilization, transfer of waste organic material into that material which is beneficial for environmental applications. Here we are discussing important parameters which based on the making of best quality of compost. For example, temperature, pH, moisture, carbon/nitrogen, oxygen, air, and nutrients these are main factors which required for proper manageable the food waste. Three major phases are involved in the composting process. Microorganisms e.g. fungi, rotifers, actinobacteria are types which present in active compost. Compost is an aerobic process for degradation of organic stuff and based on the breakdown of the large molecule into small by using living microorganism & microbes. We do food waste compost to reducing the erosion, prevent waste of food sources & controlled food waste, and save extra food for human consumption.

Keywords: Food waste; Composting; Microorganisms; Nutrients; Mesophilic phase; Thermophilic phase

Introduction

Composting is the controlled biological process in which organic material is converted into humus like substance which is actually compost. As it is the natural process of decomposition but in this method increasing the microbial growth so the waste is converted into recycled product. This product is stabilized organic matter, free from most pathogens and rich in carbon. Different residues are degraded easily and having nutritional value and fertilizing properties. This compost material can be applied in soil to increase the soil fertility [1]. In addition process of composting helpful to decrease the environmental problems by decreasing the waste size and excluding out dangerous organisms to control the composting process efficiently different conditions are necessary. Presence of oxygen has a strong value which is related with composition of microbial communities. Aeration rate helpful in more microbial activity while more pH reduces the time period for suitable composting process formation. The more interesting is that the change in microbial environment from anaerobic to aerobic at starting [2].

Materials and methods

In the nineteen century, experiments were done on the food composting under some factors in Mexico City, especially in a small area of Mexico City. Food waste composting on the small scale unit has to be easy to handle & to be simple to build with inexpensive material. The organic matter of food waste is mainly retained of waste of vegetable, fruits, & seeds, and contain carbon/nitrogen ratio for best compost quality [3].

An early study showed technology developed rapidly in that time current techniques & project includes the use of an accelerator. An accelerator which contains a mixture of food waste, for example, leaves and vegetables, etc. provide factor to produced Mesophilic circumstance [4].

Composting is a natural way to recycling organic matters into nutrient-rich soil which called compost using for the betterment of soil stability. Two types of compost are produced. Composting material contains a high level of nutrients. Decomposition of living materials & plants (leaves, fruits, seed, flower seed) using for making good composting. Some factors are most important for the degradation process for example moisture, temperature, carbon/nitrogen ratio (C/N), aeration. There are conditions and factors which must be followed for making the good quality of composting material. Good quality compost is used for the stability, maturity, & impurities for land [5].

Food waste is a major issue all around the world. According to recent research, food waste produced in more amount than average % in developing countries. Some years back, several pathways to introduce food waste was disposal in but in other countries should apply to most precise & sustainable methods for waste discard. Some process is using for management of food waste e.g. aerobic digestion & composting and the 2nd one is board.

Compost is an aerobic process for degradation of organic stuff and based on the breakdown of the large molecule into small by using living microorganism & microbes. Anaerobic digestion is introduced the following process biogas and co2 and non-stabilized degradation process. Solid waste is degradation from landfills to compost making process has much beneficial for environmental vibes. Two types of compost are produced in an environment which is properly under controlled & manageable.

Food waste is an extremely heterogeneous material which requires high moisture contents, temp, ratio, & structure. Food waste contains different types of bags; glass & plastic depend on the collection of

food which was wasted from society all around the world. If we were can't manage the proper pH, moisture, temp, and other factors then low-quality compost material produced. Several methodologies may be used to create its stability & maturity.

Even easier than paper, glass, and plastic, food waste is 100% recyclable and can be done entirely in the comfort of your own homely. Apartment or house, backyard or balcony, a compost bin, worm farm, or bokashi bin has you covered. Avoid plastic at your local butcher by bringing your own reusable container. Simply compost the butcher paper at home; it's a great source of carbon for compost bins and worms farms.

In the simple composting process, we use compost bins and add soil, waste of vegetables, other waste of food scraps, mixing well and leaves for few days then compost made with full of nutrients.

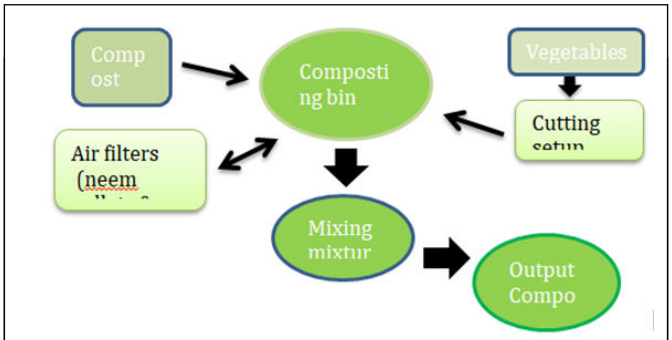

Figure 1: simple process of composting.

Compost is an eco-friendly process which involved aerobic (means oxygen loving) and anaerobic process. In the procedure of composting, complex organic substance breaks down into small pieces & needs moisture for the stability of soil & needs a proper ratio of carbon and nitrogen amount for the growth of beneficial microbes and rich nutrients. Nitrification is an oxidation process of ammonia (NH_3) to nitrate, is nitrogen cycling process in the ecosystem.

Composting matrix contains some compound like ammonia, nitrification, minerals, and other nitrates after that nitrogen cycle release emissions in the shape of liquid.

Results and discussion

Mechanism of food waste composting

In earlier times different mechanisms were used in food waste composting such as substrate degradation kinetics and Monod type analysis. In substrate degradation this mechanism analyze the oxygen using or solid degradation different researchers participate in this mechanism on large scale dynamic model were developed to initiate air recycling. Different studies focused on first order kinetics decomposition of food waste which describe the constant rate of food waste composting. Other monod type mechanism widely used to estimate the substrate degradation. Of food waste and oxygen uptake rates. This method act as starting point when the process start different numerical approaches were introduced for this purpose.

Purpose & why we need to compost food waste

Some gardeners, agriculture's, and horticulturists are taking advantage form compost material for growing and producing the best one product. Some purpose that why we required compost material. Reduce & prevent food waste source, donate extra food for human consumption, recycle to recover energy and nutrients, prevent waste of energy, handling of municipal solid waste, clean land filling, and ideal for growing organic herbs, vegetables, and fruits. Compost Saves money on fertilizers and other sources bought gardening products. Compost is a good alternative to chemicals which we used in the soil for better growth and achievements best source of the renewable product. Improves plant growth and quality and reduce erosion and nutrients run-off, & Restores nutrients back into the soil. Its works as break down of clay-based soils. Some compounds e.g. autumn leaves, sawdust, wood chips; bark, straw, mixed paper, newspaper, corrugated cardboard materials have a high ratio of carbon. While other compounds e.g. vegetables, fruits, coffee, grass clippings, dried blood materials contain a high ratio of nitrogen. Microorganisms use carbon atom as a source of energy and nitrogen retains the raw material of proteins to build their shape.

Vegetable leaves and fruit peels are collected from houses. After their selection, they are separated and then chopped into small pieces analyzing the temperature and moisture content in the start. The main properties and parameters are analyzed 1 gram of each type of fruit peel and vegetable leaves waste sample was taken, then mixed with 10 mL of distilled H_2O, for 1 hour was shaken at 150 rpm, and then for 10 min, the waste sample was centrifuged at 10,000 rpm. Then its moisture content and pH is estimated to influence the microbial activity. Then carbon and nitrogen contents are estimated. Composting material having pH in between 5.5 to 8.0. Different fruit wastes have different pH which is also related with odor emitted. It's turned to dry the sample. Heavy metals present in the material are determined by mass spectrometry. Then results were analyzed by measuring the concentration of different parameters it shows that all sample composition suitable for the composting process.

Conclusion

Food composting is an efficient and better Method for municipal organic waste management. This study, we concluded that the chemical properties of the compost Produced and the efficiency or rate of composting bins used are a beneficial way to reduce the amount of waste. The benefits of food composting were higher in Homes that generate a higher ratio of organic waste, and less level of composting programs. Different physicochemical parameters of food waste were determined that directly effect on the humus formation. Moisture content, C/N ratio, pH, temperature, presence of oxygen all are correlated.

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