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Rapid Decomposition of Solid Waste in RuralAreas

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ABSTRACT— The aim of the project is Rapid composting is the need of the days for reducing the time required for obtaining good quality Compost .A new Technology has been developed to speed up the composting using consortium of Ligno cellulolytic thermophilic Organisms. Food waste which is put into the trash will devcay and produce a foul odour which in turn will invite flies and cause various diseases .Most of the food waste that is processed using the Composting process need to spend a relatively long time ,which is about one to three months .This study Aims to accelerate Composting time through the addition of Additive Microorganisms in various quantities.

Keywords— Rapid decomposition ,Inoculants, Microbial consortium ,Additive microorganisms, Aerobic process.

I. INTRODUCTION

Is the process by which the complex organic substances break down into similar substances by the action of microorganisms using inoculums.Fungal inoculum,Actinomycytes Inoculant and few other microorganisms inititate the process of decomposition rapid in our project.They feed rapidly on deadth organisms to survive using this Inoculant.Our goal of the project is to decompose the organic waste from the kitchen rapidly andn use the compost for soil wealth and seed starters.

II. LITERATURE

Composting is the result of decomposition of organic matter through biological processes with the assistance of decomposers.The decomposition process can be Aerobic.The advantage of compost is that is hasthe complete macro and micro nutrient contained in compost include N,P,Ca,Mg,S. while the micro nutrient content include Fe,Mm,Zn,Cl,Cu,Na The aerobic composting process does not require too long duration and does not produce odour because of presence of aerobic bacteria.The microbiological decomposition process is characterized by the loss of mass and volume of organic material. The results of the aerobic Composting process are dry ingredients with less than 50 percent moisture, Dark Brown and Crumbs.

Factors affecting the composting process

The factors that most influence the composting process are the characteristics of the composted material,, and the composting method. The factors that influence the composting process are presented in moredetailed as follows.

The ratio of C/N

Charcoal or carbon (C) and nitrogen (N) are found in all parts of organic waste. In the composting process, C is an energy source for microbes while N functions as a food and nutrition source for microbes. The C/N ratio is determined based on the type of waste, but the most effective for the composting process ranges from 30:1 to 40:1. Microbes break down compound C as an energy source and use N for protein synthesis. At the C/N ratio between 30 and 40, microbes get enough C for energy and N for protein synthesis. If the C/N ratio is too high, microbes lack N for protein synthesis so that decomposition will require a longer duration.

The size of the particles

Particle size greatly determines the amount of space between materials (porosity). A sufficient pore will allow air and water to be spread more evenly in the stack. To increase the surface area, the particle size of the material should be reduced to be 2 -10 cm for a better result. Large particles will inhibit aeration and microbial performance so that the ripening process will take longer. In addition, the increasing contact between

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microbes and materials can accelerate the decomposition process .

Aeration

Fast composting can occur when there is sufficientoxygen. Aeration naturally occurs when there is an increase in the temperature which will cause the warm air to come out while cooler air to enter the compost pile. Aeration is determined by porosity, material particle size and material water content (humidity). If aeration is hampered, the comparison of carbon and nitrogen in various organic ingredients can result in an anaerobic process that will produce strong-smellingammonia. Aeration can be increased by reversing or flowing air into the compost pile.

Temparature

Heat is generated from microbial activity. The higher the temperature is, the more oxygen consumption and the faster the decomposition process is. The high amount of oxygen consumed in the microbial metabolism will produce more CO2 so that organic matter decomposes faster. An increase in temperature can occur quickly in the compost pile. Temperatures ranging from 30oC - 60oC show fast composting activities. While temperatures higher than 60oC will kill some microbes and only thermophilic microbes will survive. High temperatures will also kill plant pathogenic microbes and weed seeds. When the temperature reaches 60oC, we should immediately do a pile reversal or air distribution to reduce the temperature, because the thermophylic organisms willbe easily killed.

pH Level

The composting process can occur at a pH range of 5.5 - 9. The composting process will cause changes in organic matter and the pH of the material itself. For example, the process of temporary or local acid releasewill cause a decrease in pH (acidification), while the production of ammonia from nitrogen-containing compounds will increase pH in the initial phases of composting. Mature compost pH levels are usually close to neutral. The condition of compost contaminated with rainwater can also cause increase the pH level.

Temperature

The temperature became a parameter of exothermic reactions and important factors that influence the evaporation of water and the degradation of organic compounds . The main control indicator on the activity of microorganisms during the process of degradation of organic matter is the temperature. If the optimum temperature of microorganisms is reached, the composting process will run optimally as well. . the optimum temperature of the composting process ranges between 33-55 OC. Temperature is observed to see the difference of composting speed based on variations of additive microorganism .

After reaching the peak, the temperature of the composting process began to decrease on the 4th and 6th days. This was called as the mesophilic phase with temperatures ranging from 27oC to 47oC. In this phase,mesophilic microorganisms will remodel the remaining cellulose and hemicellulose from the previous process. On the seventh to the fourtenth days, there was a relatively uniform (stable) increase and a decrease in temperature at each reactorures ranging from 26oC - 29oC. In this phase, organic matter was decomposed and C level decreased so that the energy needed by the bacteria to move also decreased, causing many bacteria to die. In the composting process, the material was stirred to mix it with bacteria to produce good compostand to regulate the entry of oxygen into the compost pile from the aeration process.

Degree of acidity

The acidity was measured every day during 14-daycomposting using a digital pH meter. The acidity (pH) is a critical factor in the growth of microorganisms in compost. The function of this pH measurement is to determine the condition of an acidic, basic or neutral.

Moisture

Water content has an important role in composting because the decomposition of organic material depends on it. In this composting process, the main ingredients were food waste chopped using a chopper andproduced 78.94 of moisture. In the composting process, too high water content causes anaerobic conditions, because pores are more dominantly filled by water thanair so that the availability of oxygen is limited. Because food waste has high water content, it is necessary to add bulking agents which in this case was the compost. It was to provide a supporting structure for the pile of materials, providing air pores between particles and facilitating the movement of air through the mixture of materials to obtain an initial water content of 50-60% mixture. Then, the main ingredient (food waste) was calculated with a bulking agent (compost) because the water content of 50-60% was the optimum condition for developing microbes. A good balance between the pore space and the amount of water allowed microbes to develop well in degrading organic

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matter.

C/N Ratio

The C/N ratio indicates the decomposition process in composting and compost maturity has occurred. It is obtained from the comparison between carbon and nitrogen. Elements of carbon and organic matter are for example carbohydrates while the ones of nitrogen are e.g. protein, nitric acid, ammonia, etc. Microbes break down compound C as an energy source and use N for protein synthesis. Carbon element (C) produces energy while nitrogen (N) builds cell and bacterial structures. If the C ratio is too high, microbes will lack N for protein synthesis so the decomposition runs slowly. The relationship between the addition of bio-activator and the time of composting to the C/N ratio can be seenin Figure 4. Based on research data, the four reactors had different C/N ratios and experience both increases and decreases during the composting process until the end of the study. Fluctuation that occurred was influenced by the type of organic material used and ideal conditions in the pile where microorganisms could grow and develop rapidly. On day 0 the results of the C/N ratio were around 26-29 and on the last day of composting (the 14th day), there was a decline of around 13- 19.

Ligno cellulolytic thermophilic organism

- Composting involves the selection at microbiota capable at resulting the high temperature generated during the process and degrading the ligno cellulose
- It increases the composting efficiency
- Species used in this project , 1. Fungus inoculum (bio-fungi) 2. Actinomycetes inocula (bacteria)
- The ability of selected cellulolytic and ligninolytic microbial inoculants to promote the decomposition of high C/N ratio and high cellulose input in the compost.carbon:nitrogen ratio of manured compost should be in 14:1 ratio .

COLLECTION OF BIO WASTE MATERIALS

- The organic waste is collected by municipal waste bins, and hours at salem around 9km. • Dry waste 75% eg: bread , segregation of dry kitchen waste,egg shell.Wet waste 25%,wet kitchen waste.

INGREDANTS REQUIRED

- Fresh biomass (75% dry waste & 25% wet waste)
- Fresh cow dung with soil 10 percentage
- Fungal inoculum
- Actinomycetes inoculum
- Urea
- Glass container with air ventilation (aerobic)

MOISTURE

- The water present in the soil is responsible for various physiological process of micro organisms present in the soil.
- The moisture is maintained due to wet waste 25%

TEMPERATURE

- The temperature were recorded using glass thermometer
- Temperature regulates the growth and activity of microorganisms. The tempracture is different at different elevation.The species diversity and the microorganisms count is affected by environmental changes
- Temperature should be maintained throughout the composting period at 45*C during 21days of composting.

III. METHODOLOGY

- Collection of bio waste materials
- Segregation of non-biodegradable waste
- Add 75% of dry waste and 25% of wet waste
- Microbial consortia (addition of inoculation) At(15-days once)
- Maintain moisture,temperature,air (ATM)
- Curing at organic manure in sunlight
- Sieved (4mm) and stored at 20-25% at moisture

TESTING TESTING OF NITROGEN IN COMPOST

- Open the bag and smell the compost.If it smells likes ammonia then the compost is not finished processing and has too must nitrogen in it.
- The compost to smell like east.

TESTING OF pH VALUE

- Using pH paper we can measure pH in a compost extract made by mixing compost with distilled water
- . • The compost micro organisms operate best underneutral to acidic condition .
- pH in range of 5.5 to 8 during initial stage.
- The acidic condition are favorable for growth of fungiand breakdown at lignin and cellulose.
- The compost generals has a pH between 6 and 8.

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Calculate the Moisture of Compost

M=(Ww-Wd/Ww) x 100 where, M=moisture content % of compost sample Ww=wet weight of sample Wd=weight of the sample after drying

a) Weigh a small container
b) Weigh 10g of compost into the container
c) Dry the sample for 24hours in a 105-110*C oven,orfor 5 minutes in

>test anaylsed nitrogen testing=ammonia smell or earthysmell. >ph value =5.5 >tempracture=35*C to 38*C

Food waste sources and research sites

The research location is divided into two places. The first location is the site to get samples which is, in this case, the canteen of Electrical Engineering campus situated around 07o03'01.19"LS and 110o26'23.01 "BT. While the second location is where the test and sample analysis were conducted. It is located in the Environmental Engineering laboratory located around 07o03'01.93 "LS and 110o26'25.09" BT.

IV. CONCLUSION

- Testing of nitrogen value should be in ammonia smell
- Testing of pH value in 6to8
- Moisture content is 60% of water holding capacity.
- In old method it taken 90-120 days to decomposition ,but in our experiment it takes only 60-70days todecomposition

REFERENCE

[1]. Fan, Y. Van, Tin, C., Roji, M., & Woh, C. (2017). Evaluation of Effective Microorganisms on home scale organic waste composting. Journal of Environmental Management, 216, 41-48.

[2]. Barrena, R., Font, X., Gabarrell, X., & Sánchez, A. (2014). Home composting versus industrial composting : Influence of the composting system on compost quality with a focus on compost stability. Waste Management, 34(7), 1109-1116.

[3]. Bernal, M. P., Alburquerque, J. A., & Moral, R. (2009). Bioresource Technology Composting of animal manures andchemical criteria for compost maturity assessment. A review. Bioresource technology, 100(22), 5444-5453