

# Experimental Investigation on Natural Fertilizer by Using Municipal Solid Waste

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**Abstract**—The generation of waste in create by environmental problems. Increasing in human population, Urbanization and change in the life style has increased the waste load and there by pollution loads on the urban environment to unmanageable and alarming proportions in and around Perambalur. Collected solid waste materials are left in depression and on vacant plots, burned, buried and dumped in the waste land area in outside of cities. Generally, the waste material is most of villages and cities to destroyed our idea concern we have to plan of collect the solid waste material (like domestic waste) from village to separately in segment wise. After the collecting to connect with by using different methodology to preparing the natural fertilizer with in some situational period. Vermicomposting is the better option to with this problem. It is the process of conversion of organic waste by earthworm to valuable humans like material which is used as a natural soil conditioner. Vermicomposting is environment friendly and cost-effective techniques for solid waste management. It serves two main purposes for the welfare of human as it helps in the degradation of solid waste and the cost produced during this process is used as a natural fertilizer.

**Index Terms**—Natural fertilizer, Vermicomposting, Earthworm etc.

## I. INTRODUCTION

Continuous economic activities, rapid rural, population growth and the rise of living standards have greatly accelerated the generation of municipal solid waste (MSW). This poses considerable challenges for governments, civil society and private sectors to protect and promote the environment and sustainable development. Johnnesburg declaration on sustainable development has declared to “advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development economic development, social progress and environment protection at the

local, national, regional and global levels” (WHO, 2002). The Basel Convention contributes to sustainable development in aim of “protect human health and the environment against the adverse effect resulting from the generation, management, trans boundary movements and disposal of hazardous and other wastes” (UNEP, 1992). Moreover, UN commission on sustainable development also considers wastes one focus area. In the Millennium Declaration, UN aimed to minimise the generation of wastes.

Reuse, recycling, recovery and disposal of waste. Perambalur are presentative city of Tamilnadu is challenged by the substantial quantity of 3 waste,city of sweden can be a good example to introduce the advanced MSWM system. Thereby, case studies of two cities MSWM system will be compared and analysed to explore the barriers and possible solution for perambalur to achieve optimal MSWM system. Once a safe and environmentally sound MSWM system is in place atall levels, there is great potential to improve the living standards for residents and bring economic benefits.

## II. COLLECTION OF MATERIALS

Collection of materials –Set-1

| S.No | Materials       |
|------|-----------------|
| 1    | Wood briquettes |
| 2    | Grass           |
| 3    | Tree leaves     |
| 4    | Tea leaves      |
| 5    | Egg shell       |
| 6    | Paper           |
| 7    | Soil            |
| 8    | Cow dung        |

Collection of materials –Set-2

| S.No | Materials            |
|------|----------------------|
| 1    | Soil waste           |
| 2    | Cow dung             |
| 3    | Domestic waste water |
| 4    | Fruit waste          |
| 5    | Coconut shell        |
| 6    | Vegetable waste      |

Collection of materials –Set-3

| S.No | Materials      |
|------|----------------|
| 1    | Soil waste     |
| 2    | Agricultural   |
| 3    | Agricultural   |
| 4    | Cow dung       |
| 5    | Domestic waste |

**Materials used:**

Material used raw materials various domestic wastes were collected during the daily household work including:

**Eggshells:**

Eggshells were collected after using their contents and collected in a container of three eggs per day for the four months. They were exposed first to the sun for three days on newspapers for dryness and ensure that there is no content, and then it was broken smoothly to facilitate the process of decomposition and acceleration using an electric mill. Eggshells are a major source that equips the mixture with phosphorus. green component of the mixture: is the source of the nitrogen, where the nitrogen supplies microorganisms with a raw element of proteins and amino acids that needed to build their bodies and propagate. The green component mixture is also supplied with nutrient that made from wood briquettes, tree leaves, tea leaves, grass, soli, cow dung and domestic waste water are used by this is process.

Then it took the crusts and spread on the sun for about a week on the newspapers sheets for the purpose of completely dryness because it contains large amount of domestic waste water which causes high moisture mixture and thus block aerobic gaps and the activation of anaerobic bacteria and the emergence of odours as a result of anaerobic degradation and accumulation of files and insects on the mixture. the waste of cooked tea leaves consumed, where tea leaves were collected

after boiling by using a metal sieve buckle and spread on the sunlight on an iron dish to get rid of moisture in its content tea leaves was used as a source rich with carbon.

**Wood briquettes:**

The white wood sawdust, which was collected from the wood factory, it is also considered the brown component of the mixture and main source is prepared the mixture with carbonate and collected in plastic containers until the time of the experiment and did not need to dry because it was already dry. Pre composting: The shredded organic wastes are spread in layer and expose to sunlight for 7 to 14 days to remove pathogenic microorganisms and noxious gases. The pre composting process takes 7 to 14 days for their completion except cotton waste which require 14 to 28 days for their decomposition.

Collection of material: The material required for vermicomposting such as a domestic waste, vegetable waste fruit waste, are collected from markets. Also paper wastes are collected from department of technology. While remaining material such as a soil, cow dung, coconut shell, and agricultural waste are collected from nearby farm house.

**Plant waste:**

It is included the collection of leaves falling from trees added to the leaves produced by the process of trimming the trees and climber cat leg, orange and lemon, as well as the result of clips the grass by machine cutters, the plant waste is the carbon source of the mixture from which represents 20-30 parts of carbon per 1 part of the nitrogen in the mixture where the process of composting is ideally done in such conditions. This garden waste was collected and spread on the newspapers to dry it from the water for 14 days.

Because containing water causes an increase in the water content of the mixture in the case of non-drying and increase the moisture content from the normal rate of 60%, which leads to the water replacing the aerobic spaces and the transformation of the decomposition into anaerobic decomposition and produces the smell of unpleasant, addition to the start of anaerobic bacteria to slowly destroy the entire system, and damage the fertilizers.

Moisturizing water for the mixture:

Water is a light film on the surfaces of waste this film facilitates the movement of bacteria in the mixture. Although the primary materials contained large quantities of water content, but it was dried well to maintain the: first standard moisture ratio of the mixture,

Which range from 40-60%, this is because the primary materials used need varying amounts of moisturizing. Wood briquettes need more water than leaves and dried grass, while green materials and food waste do not need to be heavily moistened. The purpose of the drying of the raw material is to added the water supply of the regularly to samples of the experiment and added the domestic waste water for samples as a source of moisturizing, then they are compared to each the best source of moisture mixture.

## II. EXPERIMENTAL INVESTIGATION

### Tools used

Several tools were used in this research, they are

- Sharp knife for chopping and peeling materials
- Iron sieve to clean tea leaves
- Machine grinding to grind eggshells
- Ladle large plastic
- Large iron dishes for the publication of raw materials and drying
- Plastic containers with a cover, one capacity of 5 litres.

### Workplace:

It was made to preparation special place to work and execution the research, its specification a small garden and preparation the typical condition from warmth, humidity, airfield and shadow to ensure the typical condition.

### Method of action:

We have already mentioned that the research was based on two different types of tests and comparing them where they were:

### First:

The use of plant waste and dried grass as a source of carbon for the mixture and the use of wood briquettes for the same reason and compare them is to give better result and faster in the composition of organic fertilizer

### Second:

The use of ordinary domestic water as a source of wetting mixture and the use of domestic waste water for the same purpose and comparing them is to give better result and increase the time period of composition of organic fertilizer.

Organic substances are food for bacteria and other organisms, these substances contain carbon, nitrogen and many other nutrients. Bacteria use carbon to produce energy and nitrogen to form the protein needed to build their bodies and multiply, so during this work domestic refuse was taken

from the daily waste. The green component of the mixture, potato peel, onion, eggplant, tomatoes, peppers, carrots, vegetables, and oranges, represent the main source of nitrogen for the mixture and eggshells rich in calcium and phosphorus dried and finely grated using in an electric mill.

And the waste of cooked tea leaves was dried as a source of carbon; It is best to dry the food waste before work because it contains a large amount of water, which causes bad smell and accumulation of flies and insects' sawdust was taken out of wood briquettes from the carpentry factory, they were stored in plastic containers. Leftover leaves, trimming the trees and climber cat leg, orange and lemon, as well as the result of clips, and pre dried grass for use as the source of carbon for the mixture (the brown component of the mixture). Living organisms use carbon papers and wood wastes such as sawdust as a source of energy, plants that have been sprayed with insecticides are excluded because they reduce or eliminate the growth of microorganisms that decompose and cause odour.

- After the preparation of containers and raw materials, making the model 1, 2 and 3 which contained the leaves of trees and garden residues as dry 20 materials and domestic refuse food as a green material and containing wood briquettes as dry material and domestic refuse daily as a previous green.
- Taking the model 1, 2 and 3 placed trees and garden waste as a primary class layer equipped with carbon, and placed above it a layer of green domestic refuse materials rich in nitrogen, phosphorus, and potassium, etc. and put a layer of dry leaves then a green layer of domestic refuse, and so on to the end of the first , second and third containers .the process initiated development of a layer of sawdust as a source of

carbon and then a layer of domestic refuse source of nitrogen, phosphorus and potassium, etc. and then a layer of sawdust and then a layer of domestic refuse, thus the process was repeated to the end of the containers, taking into account the distribution of materials in an almost equal and systematic manner.

Aerobic bacteria need water to live, the mixture should be moistened, and the materials are used, but if the proportion of moisture diminishes in the mixture, the activity of agrobacteria diminishes, and if the moisture content increases, the activity of the anaerobic bacteria increases and decreases the activity of the aerobic bacteria, because water replaces voids aerobic, leading to anaerobic decomposition. The next step of the program of work is to select the quality of water used to process the moisture content that is necessary for decomposition processes, a about 1-2 litres of water is used for the first time, and it is left for two weeks closed. The components must be stirred every 3-4 days to allow the passage of air to help the decomposition because the presence of oxygen helps to accelerate the disintegration of waste. In the event of a not good ventilation, issued by the fermentation of the air odours odious.

## II. RESULTS AND DISCUSSION

Land application of MSW compost Food security is a major concern in present scenario due to continuous increase in population growth. Puts pressure on agricultural productivity. Nowadays, inorganic fertilizers and pesticides are used in frequent manner in agricultural lands. Similarly to excessive withdrawal of water and clearing of forests have taken place that poses several threats to the environment. Land degradation resulting from unsuitable land management is a major environmental and agricultural challenge, which is attributed to low nutrient availability and loss of organic matter leading to decreased productivity (tejada et al. 2009; duong et al. 2013).in order to revert the declining trend of agricultural productivity and to restore the degraded soils, fertilizer application is requisite (goyal et al. 1999). However extensive use of inorganic fertilizer without any organic supplements poses risk to soil health (ie.soils physicochemical and biological properties) and the environment (ie . Water population). therefore application of organic fertilizer

such as compost, vermicomposting and manure are now becoming more popular that support sustainability to the system. 23 6.2 Agricultural utilization of MSW compost Nowadays, much attention has been paid to agricultural utilization of MSW compost, as it helps to in managing twofolds problem i.e. soil fertility management (weber et al. 2014) and MSWM (srivastava et al. 2015). Application of MSW compost in agricultural and land usually poses positive effect on the productivity of a wide variety of cropland vegetables (warman et al. 2009; Fagnano et al. 2011; Papafilippaki et al. 2015; Mkhabela and warman 2005; chrysargyris and Tzortzakis, 2015) and also in hydroponic system (Haghighi et al. 2016).Mkhabela and Warman (2005) evaluated effect of MSWM on potatoes and sweet corn and found that this compost was a good source of P for both vegetables Recently, Haghighi et al. (2016) conducted an experiment to assess the ability of MSWM to improve the growth of tomato under hydroponic system. The authors found that 25% of MSWM added to hydroponic solution increased the numbers of fruits as compared with the control. 6.3 Role of soil microbial biomass 24 Soil contributes an important role in global nutrient cycling, which is the basic need for maintaining the healthy functioning of our ecosystem (Silva et al. 2013). Soil microbial communities help in maintaining vital function in the soil like recovery of nutrients and degradation of organic pollutants (i.e. industrial waste and pesticides) (Araujo and Monteiro 2006; Araujo et al. 2008, 2010; Goncalves et al. 2009). Soil microbial biomass (SMB) can be used as indicator to evaluate soil quality, as they are most sensitive to changes in the soil environment (Crecchio et al. 2001; Hargreaves et al.2008). As the main living part of soil organic matter, SMB drives important biogeochemical processes in soil, such as immobilization and mineralization of inorganic nutrients. It is believed that microbial biomass N add to the primary N source that can be mineralized in soil (Bonde et al. 1988; Tu et al.2006). Consequently, it improves soil nutrients profile and plant growth. Soil microbes also carry out key soil processes like respiration, mineralization, nitrogen fixation, nitrification, denitrification, methane oxidation, sulfur mineralization and degradation of recalcitrant organic matter like lignin (Silva et al .2013).

Furthermore, they have capability to accumulate heavy metal which is very much influenced by cell

surface properties such as charge and orientation of functional groups (i.e. carboxylic, amine and phosphoryl) on the cell surface for metal binding (Chen et al. 1995; Ledin 2000). Plette et al. (1995) report three different groups of Rhodococcus erythropolis. Similarly, Lion and Rochlin (1989) reported the presence of different metal binding sites on cell surface of Pseudomonas atlantica and Klebsiella aerogenes. The presence of poly His peptides in outer membranes protein of Escherichia coli accumulate greater than 11-fold more Cd II than cells displaying membrane protein without his (Sousa et al. 1996). Soil microbial biomass helps in ameliorating soil health.

6.4 Effect of MSW compost amendment on soil microbial response MSW compost amendment provides sustainability to the agro ecosystem and soil ecology. Its incorporation in land aids in maintaining long term productivity, ameliorating soil physico chemical and biological properties. It also helps in protecting the soil from over cropping, changes in climatic conditions and poor management (Crecchio et al. 2004). Soil microbial biomass greatly contributes to the soil organic matter, which accounts for 2-3% of soil organic carbon 26 (OC) (Anderson and Domsch 1989). Application of MSW compost in soil usually promotes microbial activity besides affecting soil fertility, it promotes changes in biological properties of soil either directly or indirectly as it may contain heavy metal and other toxic compounds (Araujo et al. 2010). Also, there is a direct relationship between microbial activity and soil health (Nannipieri et al. 1994). Therefore, soil microbial population and its enzymatic activity could be used as markers against changes in soil quality. Soil basal respiration rate and soil enzymatic activity have been used as useful into the soil microbial health (Pascual et al. 1999; crecchio et al. 2004).

6.5 Future scope of the project

The potential areas of further study and research are listed below,

- Performance of vermicomposting by variation in the quality and quantity of the solid waste contents can be studied in future.
- Performance of vermicomposting by variation in the earthworm species can be studied future.
- Utilization of vermicomposting as a fertilizer for different types of crops can be studied.

### III. CONCLUSION

The process of carbon to nitrogen is a major factor, each 20-30 parts of the carbon should be taken into account for the decomposition of 1 part of the nitrogen to produce the compost properly. The high proportion of carbon about 30% causes low temperature of mixture and its leads to slow compost composition, and less than 20% leads to excess nitrogen, which lost in the air in the form of ammonia and the higher pH value, which could be toxic to some microorganisms, the use of domestic waste as a source of nitrogen has been successful, as these wastes are rich in nitrogen and nutrients, this is confirmed by the initial analysis of the elements involved in the mixture. The use of dried plant waste, in the mixture as source of carbon was successful, and it gave the best organic fertilizer production results because these wastes are easy to decompose and do not need much time. The three collection materials are 1, 2 and 3 is successful results for the decomposition of the made in natural fertilizer.

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