

# AN EXPERIMENTAL STUDY ON DEGRADATION OF SOLID WASTES USING EFFECTIVE MICROORGANISMS SOLUTION

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## ABSTRACT

Around the world, especially in India one of the problems is generation of solid waste due to our modern lifestyle. This solid waste involves various categories such as agriculture waste, domestic waste, etc. Among them, organic wastes are more in quantity since they are active and adversely affect the health and environment. Different types of wastes are decayed in different time period and it depends on the nature of the waste and the environment. When the waste takes more time to decompose, then the accumulation of waste is goes on increasing. So, quick decay of waste is the solution for the accumulation of solid waste. So stimulate the decay process on solid waste we were planned to use Effective Micro-organisms (EM) solution. In this study, we consider the kitchen wastes, agro based wastes such as sugar cane leaves, bagasse, etc. An attempt is made to increase the degrading rate of these wastes by the usage of an EM-solution. The effective microorganism solution is activated with the help of jaggery and distilled water. After the observation period of 45 days, the nutritional value of the samples are considered for the final report.

**Key words:** *solid waste, Effective Micro-organisms.*

## I. INTRODUCTION

A huge quantity of different types of wastes is generated all over the world. The quantity and types vary from place to place depending on topography, climate, urbanization and industrialization. These wastes become a major global crisis because their management and disposal is not that much easy to attain.

About 960 million tons of wastes have been created during mining, municipal, agricultural and other processes by 2007 as mentioned in "Building and Environment"- volume 42. Of these wastes, approximately 350 million tons are of organic wastes from agricultural source.

Presently, in India, the waste generation rate in cities ranges between 200-870 grams/day depending upon the life style and size of the city. Per capita waste generation is increased by about 1.3% per year. Particularly, the

solid wastes keep on the largest proportion of all other wastes. These may have sources from residents, industries, institutions, construction sites, commercial areas and agricultural fields, etc.

In the above mentioned categories, the agricultural, kitchen and food wastes are highly organic. They comprise vegetables and fruit peels, spoiled food, dead crops and extract remains. Even though they get decomposed easily, they are offensive when improperly handled and disposed.

Among the agricultural wastes, the rice straw, cane leaves and bagasses occupy the major position as the rice, wheat and other cereals are the major crops cultivated in our country.

The cane leaves are used as roofing material in village sides or else it was fired. As this type of roofing is not followed in modern construction practices, they are fired which cause pollution. Many techniques and technologies are available for extracting many useful components like ethanol from the bagasse. But technical challenges in our country make it little ineffective.

Food wastes are easily decomposing materials taking a few weeks. But in commercial areas and market places, it is very tedious as large amount of vegetables are there. They attract flies and vermines developing an unhygienic condition and promotes the growth of disease vectors. Hence it is necessary to adopt a different solutions, one of which is effective microorganisms.

## II.METHODOLOGY

### Effective microorganisms:

Lactic acid bacteria	: Lactobacillus casei
Photosynthetic bacteria	: Rhodospseudomonas palustris
Yeast	: Saccharomyces cerevisiae

### Activation of Effective Microorganisms (EM) solution:

The dormant EM solution purchased is to be activated. It is the very first step involved. This activation is done with the help of chlorine free water and jaggery. For this process to be carried out, 8 liters of distilled water is mixed with half a kilogram of jaggery. Then the 500 ml of dormant EM is added to this mix and stirred thoroughly. This mixture is kept in a closed container at an ambient room temperature. It is left for a week for the complete fermentation process. The container having this solution is daily kept opened for few minutes for the release of certain gases formed because of the fermentation. During the entire activation period, the solution does not be exposed to direct sunlight. A white layer of Actinomycetesis formed on the top indicating the fermentation process.

### Collection of wastes:

As the activation process has been going on one side, the different categories of wastes which are to be tested for degradation using EM solution are collected simultaneously on the other hand. We considered the kitchen wastes, cane leaves and bagasse. These wastes are organic and goes decaying even in very normal environment but the time range to degrade highly varies with each other. For example, kitchen wastes degrade within three to few weeks depending on surrounding whereas others takes months to year.

### Degradation :

The wastes are taken in a separate buckets in a certain quantity that is 500g. The EM solution is spreaded over the wastes at regular intervals of once in a week about 100ml. After a composting period of 45 days, the sample is soil tested for various parameters including phosphorous, nitrogen, etc.

### III. PROCESS

The solution was activated as mentioned previously. The wastes about each 500g are taken in a suitable container. The solution is sprinkled once in a week about 100mg for the period of 5 days. An open condition is obtained, supporting aerobic degradation. The solution also properly maintained. While using, the pH of the solution must not greater than 3 and it is kept in a dark place. Finally, the wastes are converted to powder form and soil testing is carried over them in the laboratory.

#### Indian standards for municipal solid waste compost requirements:

PARAMETERS	REQUIREMENTS
pH	6.5-7.5
Moisture	25(max)
Organic carbon	14(min)
Nitrogen	0.8(min)
Phosphorous	0.4(min)
potassium	0.4(min)

### IV. RESULT & DISCUSSIONS

#### Vegetable wastes

PARAMETERS	% of parameters
pH	06.82
Moisture	08.67
Organic carbon	56.50
Nitrogen	01.28
Phosphorous	00.43
potassium	01.65
Zinc	01.64
Sand & silica	00.52
Salt	00.06

**Sugarcane leaves**

PARAMETERS	% of parameters
pH	06.21
Moisture	08.94
Organic carbon	48.80
Nitrogen	00.45
Phosphorous	00.07
potassium	01.36
Zinc	00.42
Sand & silica	00.34
Salt	00.06

**Sugarcane trash**

PARAMETERS	% of parameters
pH	05.62
Moisture	09.20
Organic carbon	56.40
Nitrogen	00.38
Phosphorous	00.04
potassium	01.16
Zinc	00.28
Sand & silica	00.43
Salt	00.04

**V. CONCLUSION**

The pH, nitrogen(N), phosphorous( $P_2O_5$ ) and potassium ( $K_2O$ ) of the degraded wastes are nearly as same as the requirements for compost quality. The other parameters also satisfy the maximum and minimum values required. As the macro nutrients necessary are available in right proportion in compost it can be used as compost.

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