

Rapid Decomposition of Solid Waste Using Compost Culture

¹Atul Lakhangave, ²Dhanesh Chordiya, ³Vaibhav Yadav, ⁴Vitthal Manjare

¹Department of Civil Engineering, KJEL's Trinity Academy of Engineering, Pune

¹Savitribai Phule Pune University, Pune, India-411048

Abstract:

With ever increasing population of the world and the developing countries, there is tremendous pressure on civil engineers to develop eco-friendly decomposition techniques for solid waste for mankind. So we are developing advanced technique for decomposition of solid waste material.

Rapid decomposition of solid waste is the process in which fast decomposition of waste is carried out for domestic and industrial waste which causes the major role in air pollution, also causes diseases in human respiratory system that's why it is necessary to decompose these waste rapidly. By using compost culture the solid waste which will decompose that will be used for agricultural purpose as a good fertilizer.

Rapid decomposition is the method in which organic waste such as vegetables, garden waste composted within 4 weeks. In this technique we are concentrated on micro-organism growth which plays a vital role to make compost. After the process, moisture content, zinc, carbon-nitrogen ratio was achieved as per FCO specification, so we can use that composted material as a fertilizer.

Keywords: Urea, Compost Culture, Fertilizer, Solid Waste

I. INTRODUCTION

Solid waste management is associated with the control of waste generation, collection, transfer and disposal in a manner that is in accordance with the environmental considerations. To reduce the load on disposal system must be processed. Composting can be one such process of disposal. It is the process in which organic substances are reduced from larger volumes of rapidly decomposable materials to small volume of material which continue to decompose slowly. Compost is particularly useful as organic manure which contains plant nutrients as well as micro nutrients which can be utilized for the growth of plants. Composting can be carried out in two ways i.e. aerobically and anaerobically.

The nature and operation of solid waste management varies significantly from nation to nation. Distinctions such as these are not limited to the national scale however, and can be seen at the city and neighborhood level. Regardless of scale, these differences are to some extent attributable to prevailing social economic, financial, legal and political variables at the level. There is a clear requirement to reconcile the need for more effective waste management with the constraints that are faced by local municipal corporations or governments.

General time required for composting in various methods is rather long, between 120-180 days. Considerable research has therefore been done to accelerate the composting process. This is possible by the introduction of suitable microorganisms with demonstrate efficiency in the rate of organic matter decomposition. The compost producers are presently using microbial inoculants for fast decompositions of biodegradable material and suppression of foul odor.

1. Biodegradation: It is the disintegration of material by biological means although often conflated biodegradable is distinct in meaning from compostable. It can be done aerobically with oxygen or anaerobically without oxygen.
2. Factors affecting: Almost all chemical compounds and materials are subjected to biodegradation, the relative rates of such process: - minutes, days, years, centuries.

TABLE I

APPROXIMATE TIME REQUIRED FOR DECOMPOSITION OF VARIOUS MATERIALS

PRODUCT	TIME
Food	2 Months
Cardboard Box	2 Months
News Paper	6 Weeks
Paper Towel	2-4 Weeks
Apple Core	2 Months
Milk Carton	2 Months
Cotton	5 Months

II. Methodology

1. Material: Steel net, gloves, beaker, syringe, wooden stick etc.
2. Chemical and other: urea, water, deodorant, compost culture, 25kg domestic waste, etc.
3. Procedure:
 - 1) We took a steel net which having diameter of 1.5ft and its height 3ft.
 - 2) Then we bought essential materials and chemicals required for our experiment.
 - 3) Selection of suitable site for our experiment.
 - 4) We were remembered the point that location of decomposition site should be free from sunlight and proper aeration should be available on the site. We select the location for the project at Jambhulwadi, Pune
 - 5) After reaching at location we first excavate the small pit of 3 ft.
 - 6) We install steel net in it. After that 25 kg of semi urban waste is filled in net.
 - 7) Then we mix composting culture of 25gm in water and mix it.
 - 8) Then in that urea is mix with 1 liter of water.
 - 9) After all this process we kept our project for 4 weeks.
 - 10) Mixing of water and urea (10-15gm) is done on every four days of interval.
 - 11) Temperature is measured at every rotation.
 - 12) After completion of 4 weeks we take composted sample and given to the agro fertilizer industry for testing.
4. Observations:

TABLE II

Sr.No.	Rotation Dates	Temperature
1.	07/3/2019	32
2.	11/3/2019	34.6
3.	15/3/2019	37.5
4.	19/3/2019	39.2
5.	23/3/2019	34.7
6.	27/3/2019	31.3
7.	01/4/2019	29.7
8.	05/04/2019	29

III. RESULT

1. As per FCO specification, the moisture content of sample should be in 15-20 and our result is 16.20, so it is in the limit.
2. As per FCO specification pH of sample should be 6.5-7.5% and our sample pH is 7.4 within the acceptable limit.
3. Electrical conductivity should be less than 4 and our result is 1.69 which is acceptable.
4. The minimum quantity of Nitrogen, Organic Carbon, Phosphorus and Potassium should be min. 0.8, min.12, min. 0.4, min. 0.4 respectively and our quantities are 1.05, 11.15, 0.26, and 0.34 respectively which are in the limits of FCO.
5. Zinc should be max. 1000% and our result is 369%.
6. Carbon-Nitrogen ratio should be less than 20 and our reading is 9.73 which is acceptable by FCO limits.

TABLE III

Parameter	Reading unit	Reading	FCO Specification
Moisture(Moist)	%	16.20	15-20
pH(1:2 Dilution)	-	7.4	6.5-7.5
Electrical Conductivity(1:5 Dilution)	ds/m	1.69	<4.0
Nitrogen(N)	%	1.05	Min. 0.8
Organic Carbon (OC)	%	11.15	Min. 12
Phosphorus(P ₂ O ₅)	%	0.26	Min. 0.4
Potassium(K ₂ O)	%	0.34	Min. 0.4
Zinc(Zn)	%	369.0	Max. 1000
Iron(Fe)	ppm	1980	-
Copper(Cu)	ppm	350	Max. 300
Manganese(Mn)	ppm	23213	-
C:N Ratio	ppm	9.73	<20

TABLE IV

Sr. No.	Description of Item	Quantity	Rate	Per	Amount(Rs.)
1	Steel Net	25	15	Sq.ft	375
2	Steel Frame(Including manufacturing charges)	3	50	Kg	150
3	Composting Culture	0.015	250	Kg	3.75
4	Hand Gloves	1	40	No	40
5	Beaker	1	35	No	35
6	Urea	0.5	10	Kg	5
Total Amount					608.75
Total Cost per Kg of Solid Waste					40.53

IV. CONCLUSION

Under The Project 'Rapid Decomposition of Solid Waste using Composting Culture' we have performed experiment of composting & from that experiment we have concluded that,

If there is proper technique like rapid decomposition technique has been done, then the management of organic waste which causes abundant environmental pollution can be avoided with an efficient way. Our technique takes only one month for decomposition of waste which has been proved to be time saving technique than other decomposition technique.

Under this project the organic waste not only de-composited rapidly but also it can be effectively use as a Good fertilizer for the agricultural use.

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