

Experiment on effectiveness of EM on solid waste

Nabin Bikasb
Kathmandu Metropolitan City
Kathmandu Valley Mapping Programme

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Background...

In Kathmandu, approximately 300 tons of garbage is produced everyday. The safe disposal of waste is the great challenge for KMC. According to the waste characterization, about 69% of the waste in Kathmandu can be used for producing natural compost. To reduce the quantity of land filling waste there have been several attempts made to make use of the waste and converted into compost. However, due to management problems and lack of public awareness, such efforts have been only partially successful.

The manufacturer claimed that Effective Microorganisms (EM) are highly efficient organic stimulant, which have been used over 30 countries broadly in the agriculture. Its beneficial Microorganism increases the efficacy of organic matter as fertilizers. Also, develops resistance to pests and diseases and improves the physical, chemical and biological environments of the soil. In some cases, EM can also be used to control odor from waste and as an activator to produce high quality compost. As these qualities of EM could be useful in managing KMC's waste, KVMP together Environment Department of KMC conducted an experiment to check the efficiency of EM in controlling odor from waste, reducing waste volume and producing compost.

Objectives....

The main objective of the experiment on application of EM on one day's waste to find out the potential of using EM in managing waste. Some other specific objectives are as follows:

- To reduce waste volume so as to minimizes the area of landfill space.
- To accelerate the rate of decomposition of waste and depress the offensive odorous even after long period.
- To convert the waste into useful compost and get free of harmful insects and pests.
- To find out the best way of applying EM on waste.
- To calculate the amount of space required, if EM is applied to treat waste at Teku, transfer station.

Methodology...

EM Activation

In Nepal, EM is supplied by CWDS (Community Welfare and Development Society). This EM is available in controlled form and micro-organisms are in dormant condition. It has to be therefore activated before application. For the purpose of this experiment 50 lts of EM was mixed with 500 lts of water and 50 kg molasses and stored it for 7 days in anaerobic condition. After 7 days, this solution was mixed in water in the ratio of 1:400 in a jetting machine.

Arrangement of Windrows

One-day's waste was collected at the transfer station and arranged in two different windrows. The

waste windrows were arranged beyond the platform of transfer station so that the waste would not be disturbed by rag pickers and animals.

EM spraying

The prepared EM was sprayed on the waste using the jet machine of KMC. 3000 Lt. of EM solution was made and applied on 780 cu. m wastes.

Measurement of windrows

The windrows were measured with the help of measuring tape to calculate the volume of wastes.

Recording temperature

The temperature was recorded by using normal thermometer.

Regular Monitoring

It was monitored on every Monday and Friday a week to check the temperature, pH value, Volume and odor control. Temperature was measured with the help of thermometer, volume by measuring tape, pH value by litmus and odor was checked manually.

Turning of windrows

The windrows were turned after 28 days with the help of excavator of KMC in migratory system.

Final evaluation

Volume measurement and quality of the compost was evaluated.

Materials used (Table No.1)

Particulars	Amount
EM (Effective Microorganisms)	50 Lts
Molasses	50 kg
Water	500 Lts

Total Waste collection (Table No.2)

S. No.	Collecting Vehicles	No. of trips	load	volume/ m ³
1	Tipper	35	3.00	105
2	Tractors	98	1.50	147.0
3	Mini Tata	16	4.50	72
4	Ashok leyland	7.60	6.00	45.60
			total volume	780 m ³

Measurements before the experiment with EM. (table No.3)

Sample1	Sample2
Length: 18 m	Length: 25 m
Mean breadth: 8 m,	Mean breadth: 7 m
Area: 144 sq.m	Area: 175 sq. m
Height: 2.20 m	Sl.Height: 2.8m
Volume: 316.80 cu.m	Volume: 490 cu.m

Total volume: $316.80 + 490 = 806$ cu.m

Total area: $144 + 175 = 319$ sq.m Error Percentage: 3.23%

Measurement after the experiment with EM. (table No.4)

Sample 2	Sample 2
Length: 16.50 m	Length: 22 m
Mean breadth: 7 m	Mean breadth: 6.8 m
Area: 115.50 sq.m	Area: 149 sq.m
Height: 1.80 m	Height: 2.20 m
Volume: 207.90 cu.m	Volume 329.12 cu.m

Total volume: $207.90 + 329.12 = 537.02$ cu.m.

Total area: $115.50 + 149 = 265.10$ sq.m

Area reduction: 319 sq.m - 265.10 sq.m = 53.90 sq.m

Volume Reduction: 806 cu.m - 537.02 cu.m = 268.98 cu.m

Reduction percentage: 33% (approx.)

Note: Initiation date: May 21,2001

Turning date: June 18,2001 (after 28 days)

Last monitoring date: July 3, 2001 (after 43 days)

Conclusion and recommendations...

This experiment indicates that EM is highly effective for the decomposition process and the odor control agent. The main positive aspects of application of EM are as follows.

- EM can be activating at tanker (capacity 500 Lts) in the ratio of 1:10 with 50 Lt. EM and 50 kgs molasses in anaerobic condition. After 7 days of activation period, it could mix in the ratio of 1:400 with water in the jetting machine and spray at the waste windrows.
- Both the thermophilic and mesophilic phases with in 30 days of monitoring and ready compost at 43 days.
- Temperature measuring has been recorded at the optimum values so that the late turning of windrows doesn't show any bad indicators like smell, seepage, etc.
- pH is checked by using litmus paper for acidic and basic nature of waste to the time duration.

As the volume of wastes was reduced to 33% approx. by applying EM, it can easily used to make compost pile of waste. Only the sweet fruity smell of EM was evolved during the period of composting. Temperature is retained even the tarp or shed were unmanaged. If the shed or the covering sheet is well managed, it is expected that more than 45% of the total wastes will reduce to its original volume at the same time duration. The space available around the transfer station, Teku

is seems to hold more than 10 days wastes (3200 sq.m) except the space for daily delivery. So, EM is quite effective to apply in the composting process and even for the use as deodorant to control the bad smell excreted by harmful micro-organisms.

Temperature Recorded: (table No.5)

