



MUNICIPAL SOLID WASTE MANAGEMENT BY VERMICOMPOSTING

Parag Dalal

Ujjain Engineering College, Ujjain.

ABSTRACT

Ujjain is a holy city situated at heart on India. The municipality of Ujjain (i.e. Ujjain Nagar Nigam) do not have a suitable land filling program and so all the waste generated i.e. degradable and non-degradable is dumped at site of Pandiyakehdi about 13Kms north to Ujjain city. This disposal system produces various environmental hazards so a need for eco-friendly disposals develops. One of the best options for treating organic solid waste is Vermicomposting. In this paper we highlighted the application of an earthworm degrading municipal solid waste. In the research the pH needed is 7.0-7.3, temperature 20°C to 35°C and moisture content 45-55% as in this optimization environment the worms can degrade about 90 gram worms/Kg municipal solid waste. The result of this study indicate that the organic solid waste is been treated in a period of 35-36 days throw Vermicomposting and the volume of municipal solid waste reduces to 35% of total volume.

KEY WORDS – Municipal solid waste, earthworm, Ujjain Nagar Nigam Ujjain, Pandiyakehdi.

INTRODUCTION

The Ujjain Nagar Nigam just collects the solid waste from the city and dumps them in reserve/open areas outside and inside the city. The materials from the city are transported from open trucks and dump them in a village name Pandiyakehdi (13Kms North to Ujjain). This dumping is open and do not have any management, land filling or any treatment, the stray beggars pick their needful from this dumped municipal solid waste. Land filling is not also a great option as even the developing countries are going for different techniques other than land filling as they experienced the hazards of land filling. In this research we tried to find out a suitable solution to organic solid waste, Vermicomposting (Kostecka, J., and Paczka, G. (2006)). Vermicomposting in future will be one of the best, technological sound techniques for treatment of municipal solid waste. Decentralization of solid waste collection also leads to an economic and a viable technique and also helps in Vermicomposting of municipal solid waste. The participation of private and public sector is most needed to increase the use of this technique. The present study explores the possibility of using earth worms for treatment of municipal solid waste and we came to a pleasant conclusion that about 65% of the volume is reduced in 36 days through Vermicomposting.

METHODOLOGY

The solid waste needed for data is collected on daily basis from residential area of Ujjain. After segregation, organic and inorganic are analyzed by conventional methods separated and the organic is treated. The Vermicomposting is done in Two reactors and one reactor is taken as control. Each reactor is of 50cmX30cmX30cm to total capacity of 0.045m³ (Garg, V.K., Kaushik, P., and Dilbaghi, N. (2006), Gupta, R., Mutiyar, P.K., Rawat, N.K., Saini, M.S., and Garg, V.K. (2007)). These reactors are filled with municipal solid waste and varied weights of earthworms are loaded in them. The control reactor does not contain any earthworm in it. The worms feed the organic matter

actively and excrete out granular mounds of worm cast. These earth worms are responsible for breakage of complex substances in waste to make it non-complex water soluble substances (Hidalgo, P.R., Matta, F.B., and Harkess, R.L. (2006)). The enzymes present in the symbiotic microbes are also helpful in this action. The casting contains all the essential plant nutrition including micro-nutrients which can be used as bio-fertilizers. So the residue left can be easily used for gardens or agriculture (Parthasarathi, K., Ranganathan, L.S., Anandi, V., and Zeyer, J. (2007)).

OBSERVATION AND DISCUSSION

Three vermireactors are fabricated (each of dimension 50cmX30cmX30cm) having capacity of 0.045m³. Some small openings in side and bottom are there to ensure aeration and drainage of water and to keep the aerobic condition. The water is sprinkled from the top to maintain the moisture to about 50%. The pH is also observed so that it remains near to 7. This is the most favorable conditions for Vermicomposting (Pramanik, P., Ghosh, G.K., Ghosal, P.K., and Banik, P. (2007)).

Organic components of municipal solid waste (10Kgs) were filled in the reactors with earthworm loading of 0.0gms in R₁, 500gms in R₂, and 1000gms in R₃ and their performance is observed for about 5 weeks (Tate RL. (2000)). In observation we see that the green color waste is been converted into Black/blackish brown in R₂ and R₃. The earthworm travels to downward direction with the color changes in same direction. During all 5 weeks the reactor R₁ remains greenish however the color of R₂ and R₃ start changing from 4th day.

The volume reduction in control is about 48% as no Vermicomposting is there also the color of the source does not change and remains greenish. In second reactor where we put 500gms of worms the color start changing from 4th day and the volume of manure after 36th day is 8 Liters which is about 60% of the degradation. This manure is used in gardens and farms for plantation and agriculture.

In the third reactor we have put 1Kg worms which result in 0.0 liters of municipal solid wastes and the manure is

8.11 Liters which gives its degradation about 67.5%.

TABLE 1: Total Volume of municipal solid waste used and final outcome of manure

S.No.	R ₁	R ₂	R ₃		
Days	MSW (Liters)	MSW (Liters)	Manure (Liters)	MSW (Liters)	Manure (Liters)
0	20.00	20.00	0.00	25.00	0.00
2	18.00	13.40	0.24	19.50	1.80
4	17.00	11.70	1.50	17.00	2.30
6	16.30	9.70	1.90	14.10	2.47
8	14.70	9.10	1.90	14.00	2.47
10	12.60	8.10	1.90	13.90	2.47
12	10.40	7.20	1.95	13.90	2.47
14	10.40	7.20	2.04	13.90	2.47
16	10.40	6.80	2.37	13.90	2.47
18	10.40	6.80	2.37	9.80	3.90
20	10.40	6.80	2.37	9.80	3.90
22	10.40	5.40	3.85	8.20	3.90
24	10.40	5.40	3.85	8.20	4.16
26	10.40	5.40	3.85	7.90	4.16
28	10.40	5.40	3.85	4.50	6.48
30	10.40	3.20	4.56	3.20	7.11
32	10.40	2.20	6.89	2.60	7.98
34	10.40	0.80	7.23	0.70	8.01
36	10.40	0.00	8.04	0.00	8.11

CONCLUSION

The original color and appearance changes from green color to blackish which changes from top to bottom with the downward direction of the earthworm. The total time period is 36 days and the temperature and humidity is maintained by sprinkling water from top. The garbage volume is reduced to 52% of control to 32.5% for vermicomposting.

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