An Experimental Analysis on Conversion of Municipal Solid Waste Into Nutrient Rich Soil

Modi Musalaiah[1], P.Ram Mohan Reddy[2], J.Pavan Kumar[3], S.Naga Sivaji[4], Sk.Himam Saheb[5] And V.Vinod Kumar[6]
[1]Asst.Prof Dept of Civil Engineering
[2, 3, 4, 5, 6]Dept of Civil Engineering
[1, 2, 3, 4, 5, 6]MVR College of Engineering and Technology

Abstract- *Solid waste management is one of the most important challenges in urban areas throughout the world and it is becoming a critical issue in developing countries where a rapid increase in population has been observed. Solid waste is one of the third pollutions which are next to air pollution and water pollution. Now a day, civil engineers who are working under municipal sanitation departments, are facing lot of problems, to manage the municipal solid waste (MSW). Generation of municipal solid waste continues to rise, which leads to loss of resources and increased Environmental risks. The improper collection, transportation, separation and handling will increase the risk caused by the solid waste. The conventional treatment of wastes such as open dumping and land filling cause environmental Degradation. Municipal Solid Waste consists of more than 40 percent of organic waste, so composting most of this waste would be the best way to reduce the quantity to one fourth resulting in nutrient rich soil amendment. Since the major fraction of wastes generated in India is organic wastes, composting has emerged as one of the Best methods for treatment of wastes. The present study was conducted to transform the solid waste into nutrient rich soil by the application of available methods of composting and landfilling methodologies. Present experimental work has been conducted in Vijayawada city. Vijayawada is the biggest city in the district as well as second largest city of the state of Andhra Pradesh and it is capital of Andhra Pradesh. It is active in political, commercial, transportation etc. certain amount of solid waste from the municipality dump yard was collected and processed as described in methodology. The obtained results shows that the converted waste as a soil contains high rich nutrients which is suitable to replace as a chemical fertilizers, and which also acts as conditioner for the existed soil.*

Keywords- Solid Waste, Treatment, Disposal, Composting, Landfilling and Nutrient Rich Soil

I. INTRODUCTION

In modern times, the size of the town and cities are increasing at a very fast rate and therefore solid waste generated daily has a very high magnitude and therefore its collection and disposal is necessary, to maintain good hygienic condition in the society. Waste, in general is a derogatory term which implies something unwanted, useless, pejorative and filthy. The term waste is very complicated to define, as concepts, views or attitudes towards waste are usually very subjective and often exceedingly distinctive and conflicting. The (SWM) systems exist in most of the urban center's since last few decades. However, these systems have yet to emerge as a well-organized practice. Although, the solid waste characteristics in different urban centers vary significantly, there is a meager effort to tailor the system configuration to the waste characteristics. Waste management has become a critical area of practice and research due to the increasing concerns of environmental pollution and resources shortage. Most of solid waste management professionals recognize that there is no single, simple solution to solid waste problems. Instead an integrated approach, combining the elements of multiple techniques, is used in an increasing number of cases. In many countries, a large proportion of municipal waste is not disposed properly posing a potential environmental threat due to presence of pathogens and toxic pollutants. In Ahmedabad about 3500 metric tons of solid waste is generated on a daily basis. Currently more than 1600 metric tons of waste is collected under the "Door or Gate to dump project" and transported to processing plant/land field. The solid waste expresses highly diversified nature at physicochemical and biological aspects which is highly influenced by socioeconomic localities. The microbial diversity studies are important in order to understand the microbial ecology in the ecosystem.Due to population growth, industrialization, urbanization and economic growth, a trend of significant increase in MSW generation has been recorded worldwide. MSW generation, in terms of kg/capita/day, has shown a positive correlation with economic development at world scale. Due to rapid industrial growth and migration of people from villages to cities, the urban population is increasing rapidly.Present experimental work has been conducted in Vijayawada city. Vijayawada is the biggest city in the district as well as second largest city of the state of Andhra Pradesh and it is capital of Andhra Pradesh. It is active in political, commercial, transportation etc.

II. MATERIALS AND METHODS

Municipal Solid Waste Management (MSWM) constitutes a serious problem in many Third World cities. Most cities do not collect the totality of wastes generated, and of the wastes collected, only a fraction receives proper disposal. The insufficient collection and inappropriate disposal of solid wastes represent a source of water, land and air pollution, and pose risks to human health and the environment. Solid waste management applies in a manner that is in accordance with the best principles of public health, economics, engineering, conservations, and that is also responsive to public attitudes.

Certain amount of solid waste from the municipality dump yard was collected, segregated and processed in the laboratory. The collected waste was divided into two parts, the entire first part was used to fill the land by sanitary land fill method and the remaining amount of solid waste was further divided as six parts, which was composted by various composting processes. The processing methods and sample codes tabulated in Table.1.

Table.1. Sampling Codes

SAMPLE NAME	SAMPLE CODE
INDORE	S1
BANGLORE	S2
NUSOIL	S3
TOLLMACHE	S4
DANO	S5
BUHLER	S6
LAND FILL	S7

III. RESULTS AND DISCUSSIONS

The generated solid waste disposed and digested to a time period of three months by six composting processes and one land filling method. The digested samples are collected and analysed for the parameters of p^H, Moisture, Magnesium, Calcium, Sodium, Carbon, Nitrogen, Potassium, Phosphorous, Organic Matter and C/N Ratio according to respective laboratory methods. The obtained results are compared with standard data which and the results are presented in Table.2.

Table.2. Results of Analysed Parameters

SAMPLE CODE	P^H	N	C	C/N	OM	MOIS	P	K	Ca	Na	Mg
S1	6.1	0.65	32	49.23	25	12	1.4	0.72	2.8	1.2	0.4
S2	7.3	0.72	25	34.72	33	15	1.8	0.52	1.2	1.8	0.9
S3	6.8	0.81	25	30.86	28	26	1.7	0.39	1.5	0.56	1.2
S4	6.4	0.59	28	47.45	39	18	1.6	0.74	2.1	0.79	1.7
S5	7	0.62	20	32.25	21	32	0.5	0.12	4.3	1.05	0.8
S6	5.9	0.65	32	49.23	60	27	0.9	0.6	3.2	2.07	2.1
S7	6.2	0.42	33	76.74	72	30	1.25	1.2	1.7	1.81	0.5
Standard	6.75	0.6	***	37.5	20	50	0.75	1.15	2.5	***	3

All the values are presented in % weight basis

The obtained results of the samples are analysed and they were shown in Figure.1. and Figure.2.

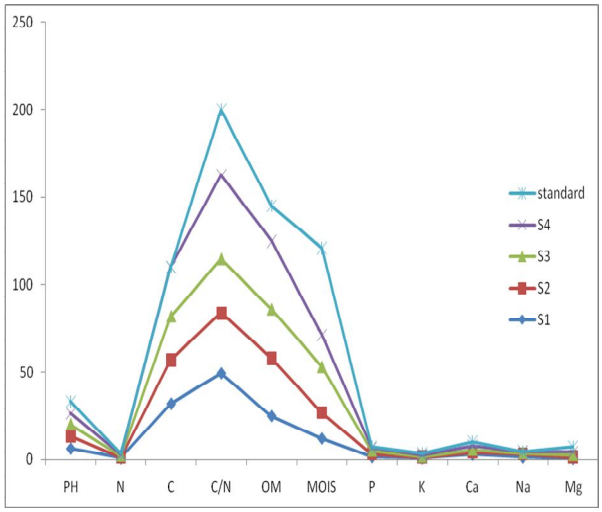

Figure.1. Comparison of S1, S2, S3 and S4 samples

Comparison of S1, S2, S3 and S4 samples with standard data are plotted on graph. S3 sample almost satisfies the standard norms of the soil nutrient properties but the moisture content and potassium content was too low. In the samples S1, S2 and S4 some of the parameter exceeded the given limits and some are below the limits.

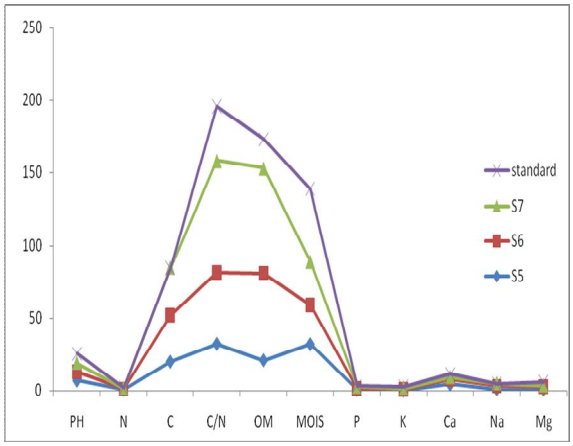

Figure.2. Comparison of S5, S6 and S7 samples

Comparison of S5, S6 and S7 samples with standard data are plotted on graph. S5 sample almost satisfies the standard norms of the soil nutrient properties but the potassium, phosphorous and magnesium content was too low. In the samples S6 and S7 some of the parameter exceeded the given limits and some are below the limits.

IV. CONCLUSIONS

In our study we conclude that, one can convert the useless waste to useful product.All the soil samples are nutrient rich products. The soil obtained from Dano process (S5) and Tollmache process (S4) is richer than all other processes. The soil obtained from landfill process (S7), has rich in organic matter, moisture, calcium, C/N ratio and potassium. The manual methods of Banglore (S1) and Indore (S2) processes are more reliable than mechanical methods (S3, S4, S5, S6, and S7). The tollmache (S4) is costlier than other methods

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