ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

CHARACTERIZATION STUDY & TREATMENT OF MSW OF CROWDED RESIDENTIAL AREA OF AMRAVATI CITY, MS, INDIA

Rasika D. Gaigole*, Ankush. R. Pendhari

*1,2 Department of Civil Engineering , G.H.Raisoni College of Engineering and Managenment, Amravati (M.S), India

ABSTRACT

The increasing population is worldwide problem which can be seen in Amravati city also. Due to rapid growth of population in Amravati municipal corporation area & changing life styles has resulted in increased waste generation. As the handling of MSW is the responsibility of the Municipal Corporation & solid waste management strategies adopted by AMC including management of MSW at compost depot. The main objective of this study is to suggest proper management of solid waste at all levels of the city through a study of an area within city.

An approach towards the management of solid waste by treatment depending on characteristics is done in this study. This paper offers a unique MSW investigation with regard to both physical & chemical characteristics, (pH, Moisture content, Organic content, Carbon content, Volatile & Non volatile content) leading to illuminate the necessary management policies with greater regional relevancy. The chemical parameters give favorable results for composting. Representative characteristics of MSW were studied during November 2013-March 2014 period. Existing municipal solid waste management by Amravati Municipal Corporation was studied extensively in respect of characteristics & disposal methods. Compost is a cheap, effective & long term way of improving the soil to grow better crops. This paper also offers comparative study of both manual composting method, Indore & Bangalore. NPK values are also analyzed for the same methods.

KEYWORDS: Bangalore method, Composting, Indore method, MSW, Physical & Chemical Characteristics.

INTRODUCTION

Solid waste is basically unwanted or discarded material that is not a liquid or a gas; it can include organic waste, paper, metals, glass, cloth, brick and rock, yard waste etc. The term waste implies that it is of no concern to anyone & is therefore of no value. Municipal Solid Waste Management is necessary & important because of scarcity of land, dumping site etc. Environmental impact due to gaseous & liquid discharges has received wide attention probably due to its immediate impact on human health. The land pollution has received limited public attention. For management of MSW, its characteristics study is important for proper treatment. This paper offers the study of characteristics & treatment of Municipal Solid Waste within the area of Amravati city.

Municipal Solid Waste (MSW) is one of the most important problems as it generated is not processed in this city. This study is indicative from important management solution for Gadge Nagar area of Amravati city. It is the dense populated area in Amravati, solid waste generated is mainly domestic waste & residential waste i.e. Organic Contents obtained in large quantity. The best quality of fertilizer can be obtained by composting of organic waste that can be used for agricultural purpose. This study is based on using organic content of MSW for generation of compost; electricity & biogas can also be generate through it. Due to this MSW generated from locality can be used & ultimately it decreases load on the Amravati Municipal Corporation. This paper simply based on treatment of such large amount of MSW which is generated & is not processed.

C/N ratio was calculated from the values of total organic carbon (TOC) & total Kjeldahl nitrogen (TKN) & generally the value range of C/N ratio in shorten the composting cycle without a compost product quality degradation & suggested a method for rapid degradation & maturation of MSW as: rapidly heat the composting material to 50°C & maintain the surrounding at that temperature point during the whole composting process, provide suitable amount of air & water & turn over the pile daily (Yong Xiao, et al, 2009). The organic fraction of a municipal solid waste was composted in three piles (2m high x 2m width x 3m length). The piles were watered regularly to maintain moisture contents at around 55% & were turned every 7 days to improve the Oxygen level inside the pile (Manuel Tejada, et al, 2009). The decrease

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Scientific Journal Impact Factor: 3.449
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in soil organic matter is paralleled by declines in soil fertility. Composted urban waste can be added to agricultural land for both waste disposal & to improve soil fertility. Organic materials, such as municipal solid waste compost, promote microbiological activity into soil (J. C. Garcia-Gil, et al, 2000).

METHODOLOGY

Present Study of Municipal Solid Waste at Gadge Nagar, Amravati (September 2013 – March 2014)

In this study, characterization of Municipal Solid Waste of Gadge Nagar area which is situated adjacent to National Highway No.6 is carried out. Information is collected through visits at various places like containers site, residents, AMC etc. The information is collected about the place of container, population of the area, generation of MSW, quantity of MSW & its characteristics.

There are 11 hotels, 2 bars, 1 vegetable market, 2 community halls, around 30 to 40 road wanders & 5 hospitals. Generation of organic waste is available in large quantity in this area according to study. For this organic waste physical as well as chemical characteristics such as pH, Moisture Content, Organic Content, Carbon Content, Volatile & Non Volatile Content is carried out & for compost manure obtained by Indore & Bangalore method. NPK tests are also carried for the manure resulting from Indore & Bangalore method.

Fig. 2.1 Gadge Nagar with Location of MSW Containers

Necessity of MSW Management

The necessity of solid waste management is to reduce the quantity of solid waste disposed off on land by recovery of materials and energy from solid waste. Functional elements of MSW Management, from the point of generation to final disposal can be grouped into the six functional elements: (a) waste generation; (b) waste handling and sorting, storage, and processing at the source; (c) collection; (d) sorting, processing and transformation; (e) transfer and transport; and (f) disposal. Gadge Nagar area is surveyed. And on the basis of observing problem & discussion with local residents, it is suggested for improvement in transportation & disposal of solid waste. Management of Solid Waste is not proper; frequently waste spills out from the container. Only dumping of waste is carried out at the dumping yard without treatment. As the solid waste generated in this area is mostly organic content, so it is better to provide composting as an efficient treatment.

RESULT AND DISCUSSION

Physical Composition of MSW

The physical composition of MSW is carried out once in this project. Various ingredients such as Fruit/ Food waste, Paper, Plastics, Cloth, Wood, Metals, Glass, Rubber, Pebbles & Fine sand is weighed& expressed in percentage also. The total quantity of Municipal Solid Waste is taken 5Kg; the percentage of the physical composition of MSW is calculated for this quantity. The fruit waste, vegetable waste, food waste obtained in large quantity around

50-60%, while the metal, glass, rubber obtained in very small quantity. Street sweeping of the area results fine sand & pebbles in 10-11%. The paper waste also somewhat in range 10-11%, due to agencies in that area. The table shows physical composition of MSW of this area.

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Table 3.1 Physical Composition of MSW

Sr. No.	Parameter	Weight	Value
1	Fruit/vegetable waste/ Food waste	3 Kg	60%
2	Paper	510 gm	10.20%
3	Plastic	250 gm	5%
4	Cloth	150 gm	3%
5	Wood	75 gm	1.50%
6	Metal	20 gm	0.40%
7	Glass	40 gm	0.80%
8	Rubber	3 gm	0.06%
9	Pebbles	400 gm	8%
10	Fine sand	550 gm	11%

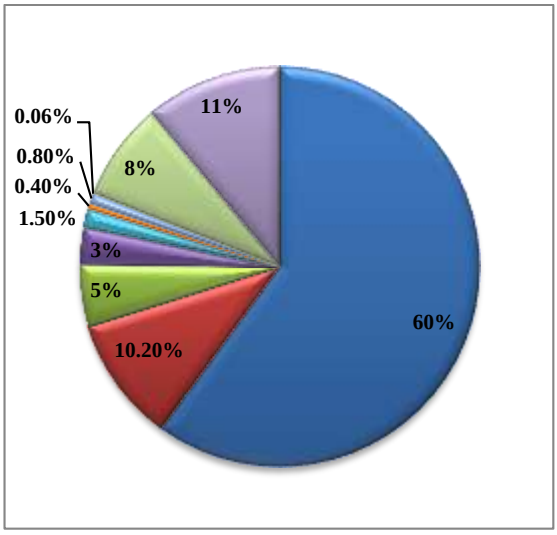

Fig. 3.1 Graphical Representation of Physical Composition of MSW

Chemical Characteristics of MSW

The various chemical characteristics carried out for MSW such as pH, organic content, moisture content, carbon content, volatile & non volatile content etc. and for the compost fertilizer nitrogen N, phosphorus P & potassium K are measured. The average chemical characteristics of MSW in different month are as shown in table.

Table 3.2 Parameters of Municipal Solid Waste

Sr.No.	Parameters	Nov 13	Dec 13	Jan 14	Feb 14	Mar 14
1	pH	7.26	7.46	7.67	7.82	7.2
2	Moisture content	28.16 %	28.77 %	33.76 %	38.86 %	37.27 %
3	Organic content	98.4 %	97.66 %	97.58 %	99.11 %	85.61 %
4	Carbon Content	57.61	56.64	56.60	57.48	49.65
5	Volatile &	4.71 gm	4.67 gm	4.18 gm	4.82 gm	4.07 gm
	Non volatile content	0.28 gm	0.32 gm	0.81 gm	0.17 gm	0.92 gm

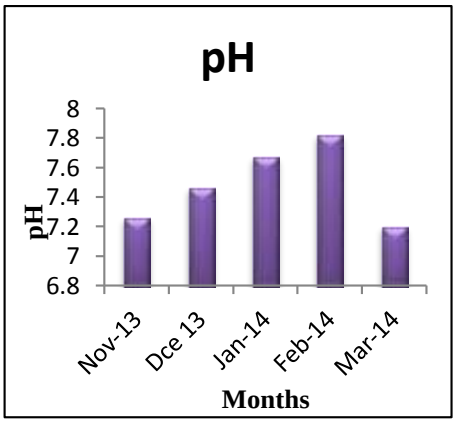

Fig 3.2 pH of MSW

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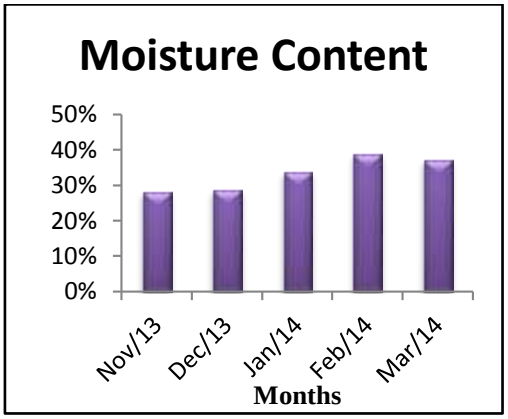

Fig 3.3 Moisture content of MSW

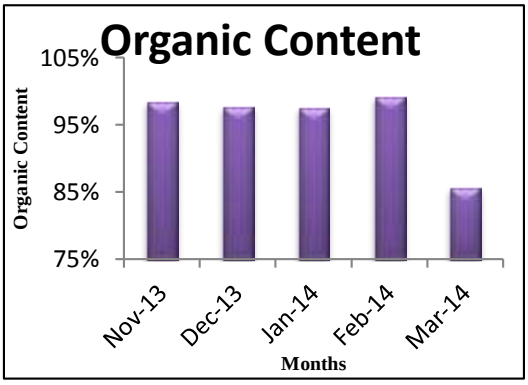

Fig 3.4 Organic content of MSW

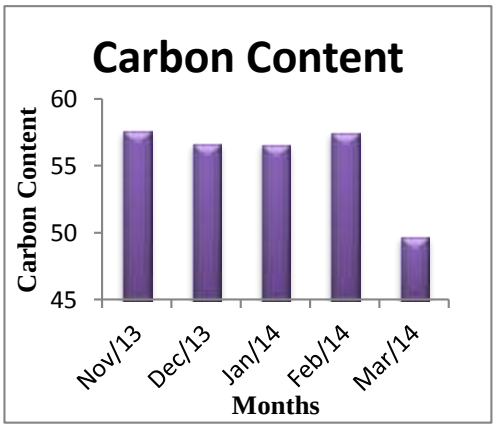

Fig 3.5 Carbon content of MSW

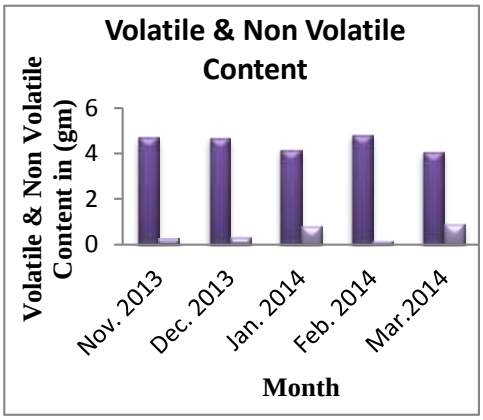

Fig 3.6 Volatile & Non Volatile content of MSW

NPK nutrients for compost fertilizer of MSW

NPK are important nutrient for plant growth. As NPK value is maximum in compost, hence it contains highly organic material which is good for plant. In present research, Nitrogen is measured by Kjeldahl method, for Indore & Bangalore method of composting.

The table shows the NPK nutrients of Indore & Bangalore method of composting sample. As Bangalore method is anaerobic method, the decomposition of organic contents is slightly varies with Indore method. Indore method is aerobic so organic content decomposes easily, there is loss of CO2 during this process. Phosphorus (P) is carried out in mg/kg; it is obtained in large quantity for Indore method. Potassium (K) is also carried out in mg/kg; it is comparatively more than Indore method.

Table 3.3 NPK Nutrients Value for Indore & Bangalore Method

Sr. No.	Parameters	Bangalore Method	Indore Method
1	Nitrogen (N) %	1.03	1.17
2	Phosphorus (P) mg/kg	668	760
3	Potassium (K) mg/kg	230	206

CONCLUSION

Present study carried out on Characteristics study & Treatment methods of Municipal Solid Waste of Gadge Nagar Area of Amravati City. All the physical & chemical

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characteristics of MSW of Gadge Nagar area obtained from this study are within the standard range. Rather than crowded area the generation of solid waste is medium. So the best compost fertilizer can be prepared by manual composting i.e. Indore & Bangalore method of MSW for this area. The quality of fertilizer depends on the amount of NPK nutrient and on the basis of study, experimentation & results, it is concluded that comparatively Indore method is beneficial & suggestive for MSW composting of Gadge Nagar area.

The generation of biogas & generation of electricity from MSW can be achieved by providing biogas plant at compost depot. As well as recovery of possible materials for recycling and the segregation of wet & dry waste should be carried out for proper management of MSW. Waste management at landfill site & exciting compost depot should be well planned & equipped with new technologies for disposal of MSW such as provision of plantation, fencing, water & electricity etc.

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