

SUITABILITY OF URBAN WASTE COMPOST FOR ORGANIC FARMING- A CASE STUDY OF PUNE CITY

V. U. Khanpure
 (Department of Civil Engineering, Savitribai Phule Pune
 University, Pune-07)
 Email: vukhanpure.scoe@sinhgad.in

Aarti Ram Patil
 (Department of Civil Engineering, Savitribai Phule Pune
 University, Pune-07)
 Email: patilaarti219@gmail.com

Abstract—Municipal solid waste management has become a serious problem in urban areas and the major portion is organic matter. Almost 40-60% waste is organic waste. The objective of the study was to assess nutrient value and toxify the level of compost produced from 3 different location in Pune city. Samples have shown the increase in C: N ratio where as in Hadpsar location samples has less organic carbon than required. Whereas samples were not showed significant heavy metals concentration. Therefore, the study of MSW compost samples is important to know its suitability to use as organic fertilizer in a farming.

Keywords— Urban waste compost, Heavy metals, Nutrient potential, organic farming, suitability.

I. INTRODUCTION

In India disposal of urban solid waste is major challenge for municipal authorities. More than 90% of these waste is used for landfilling and dumping on outside of town and cities, which have serious environmental problem

The various characteristics which determines the quality of composts are moisture, various nutrients, heavy metals, water holding capacity, organic matter, various pathogens etc.(6). To reduce the harmful effect of contaminants to public health, plant, soil, and the environment the study has undertaken .

II. Materials and methods

Three urban waste samples were collected from various composting plants operating under the municipal corporation in different locations in Pune on a month of January 2018.The samples were collected once from each plant by using grab samples. Details were also collected along with samples.

Table.1 Basic information on the compost samples

Location	Plant capacity (tons/day)	Segregation status	Method of composting
Aundh	2	PS	Mechanical composting
Hadpsar	250	PS	Windrow composting
Peshwe park	10	PS	Windrow composting

PS-Partially segregated.

2.1 Analytical methods

The samples were analyzed in fertilizer control laboratory, Pune. The procedures in the testing of

fertilizers by complying with the requirement of ISO/IEC 17025-2005(9).

- Estimation of pH- by pH meter
- Estimation of moisture- by gravimetrically
- Estimation of conductivity-by using electric conductivity meter.
- Gravimetrically by igniting the sample in muffle furnace at 650°-700° C for 6 hours.
- Estimation of total nitrogen-using scalar auto analyzer.
- Estimation of C: N Ratio-
- Estimation potassium-by using flame photometry.
- Estimation of heavy metals- Fe,Cu, Zn, Cd, Pb, Cr, Ni (ppm)by using absorption spectrophotometer.

2.2 Quality Evaluation

To know the importance of parameter weighing factor is used The weighing factor was maximum for organic carbon due to its important role in improving soil quality weighing factor is varied in 1 to 10, depending on their potential in improving soil health(C.Lathika and M.P Sujatha 2015).

In heavy metals which is clean index the weighing factor is 10 for cadmium due to its high level of toxicity. Lower the weighing factor lower will be the toxicity level of heavy metal(10).

Table no.2

parameters	Weighing factor
Moisture(%)	1
pH	8
EC(ds/m)	2
OC(%)	10
N(%)	8
C:N ratio	8
P(%)	7
K(%)	6
Ca(%)	4
Mg(%)	4
Fe(ppm)	3
Cu(ppm)	3
Mn(ppm)	3
Zn(ppm)	3
Cd(ppm)	10
Pb(ppm)	8
Cr(ppm)	8
Ni(ppm)	5

III. RESULTS AND DISCUSSION

3.1 Method of composting-

The examination of composting process at various location samples pre-processing were not followed by

Hadpsar site. At all sites it was observed that partially segregation were done. But the non-segregated non-biodegradable wastes like plastic, rubber, metals etc. were removed manually. Post processing method sieve was done by either manually or mechanically.

3.2 Physical Characteristics-

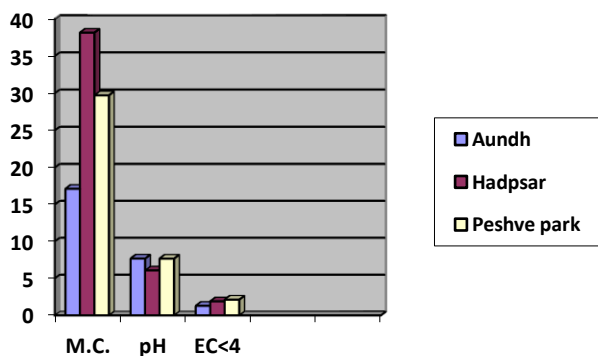
Colour and moisture content in the composts sample are the important physical characteristics for study. Most of the compost samples in general were with acceptable colour varying from dark brown to black except those from Hadpsar site, which was black in colour.

Moisture content in the samples varied from 15% to 40%. Highest moisture content was in Hadpsar site. And lowest in the Aundh site. It is desired to have 15-25% moisture in the finished products. Composts with less moisture may not have fully stabilized. And excessive dry composts are often dry and unpleasant to handle. Composts with too Moisture content becomes too clumpy and increases the transportation cost (C.Lathika and M.P. Sujata 2015).

Physical characteristics of samples-

Table no.3

Location	Colour	moisture	pH	EC	C	C:N
limits	Dark brown to black	15-25	6.5-7.5	<4	Min16	20:1
Aundh	Dark brown to black	17.13	7.69	1.29	42.74	63.14
Hadpsar	Dark black	38.16	6.08	1.89	13.51	43.3
Peshve park	Dark brown to black	29.73	7.68	2.13	50.55	22.4



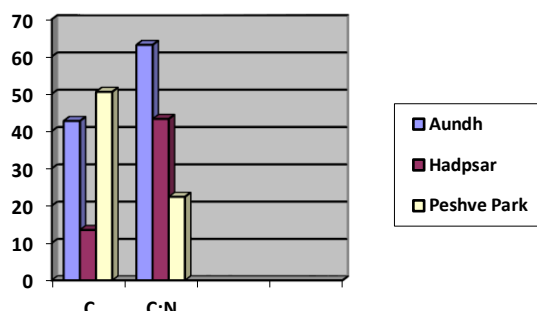
Graph no.1

3.3 Chemical characteristics-

EC, pH, organic carbon and C:N ratio were analyzed and the data are given in table 3.

The highest pH was seen in the sample of from Peshve Park which is 7.69. The high value is noted in 2 samples might be due to improper handling of compost. Electrical conductivity were within limit thus they are found suited for organic farming under Pune condition. Carbon content was low in the sample of Hadpsar site which should be > 16.

C: N ratio is consider as chemical indicator for compost maturity with respect to organic matter and N cycling. C: N ratio varied from 20:1 upto 63.3 which was highest the highest C:N ration was in the sample of Aundh and the lowest value was found in hadpsar. Ideal compost feedstock mixtures are to have initial C: N ratio of about 20:1.



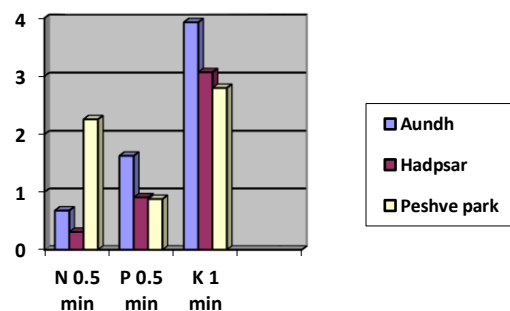
Graph no.2

3.4 Major nutrients-

Nitrogen, Phosphorus and potassium are the major nutrients taken by the plant from the soil. Only nitrogen was less than the required in the hadpsar sample. Remaining all were within permissible limit according to fertilizer control odour 1985.

Table no 4

Location	N	P	K
limits	0.5 min	0.5 min	1 min
Aundh	0.68	1.67	3.93
Hadpsar	0.31	0.91	3.07
Peshve park	2.26	0.88	2.8



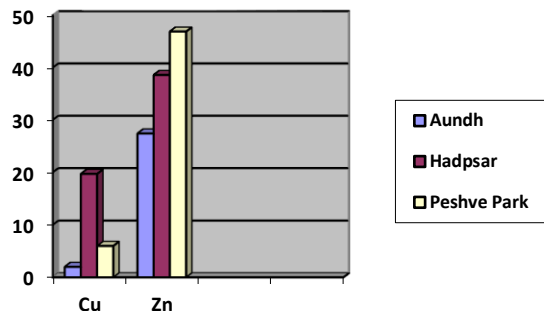
Graph no.3

3.4 Micro nutrients-

content of micro nutrients Cu and Zn in the samples ranged between 1-20, 2-4 respectively.

Table no.5

Location	Cu	Zn
limits	300mg/kg	1000mg/kg
Aundh	1.994	2.503
Hadpsar	19.7	3.984
Peshve park	5.98	2.89



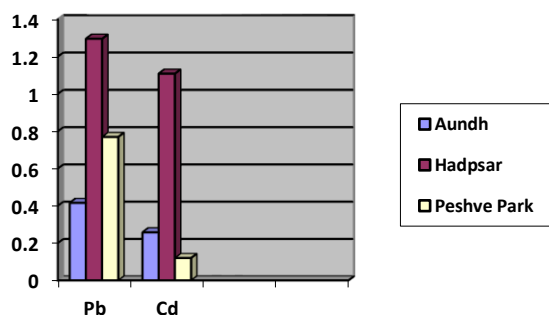
Graph no.4

3.5 Heavy metals-

Contamination composts with heavy metals is considered as undesirable quality parameters. In the present study Pb and Cd are within prescribed limits of fertilizer control odour, 1985. Which is not harmful for the use of organic farming.

Location	Pb	Cd
limits	100mg/kg	5mg/kg
Aundh	0.416	0.258
Hadpsar	1.296	1.109
Peshve park	0.77	0.12

Table no.6



Graph no.5

3.6 Evaluation of compost quality-

As per the analysis the Quality of compost from the hadpsar site is lowest and medium from the Aundh site and good quality of compost from the Peshve park site.

4. CONCLUSION

Based on the results of the study, it is concluded that in all the samples C: N ratio were more than the required and in the compost C: N ratio has weighing factor 8 which is undoubtedly important parameter for the plant growth. Increase in C: N ratio can reduce the N availability in the plants.

Moisture was more in hadpsar and peshve park site,

increase in moisture makes compost clumpy. Excess water interferes oxygen accessibility. Organic carbon was low in Hadpsar site than permissible limit which is important parameter in the composting and the weighing factor is 10 for OC.

The study suggests proper method for segregation to use mineral additives for the reduction of C: N ratio for quality improvement of composts.

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