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Characterization and Utilization of Municipal Solid Waste Soil of Open Dump Site of Potiya Durg District in (C.G.) India

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Abstract:
The aim of the study is to provide information about composition and extent of transformation of waste organic matter in open dump site in POTIYA. District Durg. CHHATTISGARH STATE. The studies of the characterization of these municipal solid waste six samples are different depth (0ft, 1ft, 2ft, 3ft, 4ft,5ft). The initial composition of municipal waste was indicated an N, P, K and trace element-Ca, Mg, Zn, Fe, Cu, Mn. Physical properties pH, EC, salinity, % of moisture, this research works examine the effects of municipal solid waste soil in Potiya, with a view of creating environmental awareness for both the government and the public about the states of various dump site in the district Durg. MSW soil of Potiya has high concentration of N, P, and K high moisture content and high value of micronutrient (Ca, Mg, Zn, Cu, Fe, and Mn) making composting the best treatment strategy. This result indicated that municipal solid waste soil had potential for recovery soil, and its use for soil amendment.

1. Introduction

Land filling and open dumping is the oldest and cheapest way of disposing municipal solid waste (MSW), Indeed depending on location up to 95% of solid wastes generated worldwide is currently disposed of in landfill. Landfill will continue to be the most attractive disposal route for solid waste. [Nelson.1994]. The use of soil reclaimed from mswc use as an alternative source of organic matter and plant nutrients to land application because most agricultural soils have been used extensively for crop production for extended period of time and are usually low in soil organic matter and essential plant nutrients .[Parkpian et. al.2002].The organic content of waste is generally higher in developing countries, therefore, composting is an appropriate alternative for waste management.[Kanat G. A. Demir.et, al 2006] Biological treatments offer a cost effective sustainable solution for urban organic wastes . In practice, the main biological process applied for solid wastes is composting.

[Tosun. I. M. T. Gonullu. E. Arslankaya.et, al. 2008].Compositing recognized as a viable alternative and beneficial use of end product for waste management is the biological degradation of highly concentrated biodegradable organic wastes in the presence of oxygen (aerobically) to carbon dioxide and water .the final product of composting is a stable humus like material known as compost .[Bari, Q.H. and, A. Koenig, 2001] . The bioconversion process is gradually emerging as a natural, promising environment –friendly and potential microbial process to degrade environmental contaminants.[Colwell, 1994]. The release of nutrients during the decomposition of urban compost in soil is similar in effect to that of other manures ,substantial improvement in pH ,organic matter, major, secondary and micro-nutrients have been observed on the application of garbage compost on soil .[Tarjan,1977, Banerjee et. al 1979,Khan et,al 1981, Hartenstein and rothwell, 1972, Mishra 1979, and Kattal, Sharma 1979]. Agriculture lands amended with municipal solid waste compost (MSWC) can be a way to return the organic matter to soil and minimize the risk of environmental pollution .Various studies have demonstrated improvements in soil fertility using a variety of compost material .[Parvaresh et, al. 2004, Parthasarathi et, al 2008, Ogwveeleka, 2009]

2. Materials and Methods

2.1. Sampling Sites

The study was carried out in the experimental field "POTIYA situated in district Durg in CHHATTISGARH STATE. Durg city of country India lies on the geographical coordinates of 21^0 11'0''N, 81017'0"E. This site is open dump site, the Area of site is 49 square kilometer. Potiya open dump site is 10 years old. Daily 70 tones solid waste materials are dump in this site. The dumped material consists of 60 tones household waste and 10 tones municipal solid waste. The city garbage wastes from district Durg consisted of vegetable, fruits, plant and other kitchen wastes beside, few glass pieces, plastics and metal pieces, pieces of polythene, paper, stone, cloth, wood, grit, leaf, grass, charcoal waste, pieces of cement wall, thread, rags, pieces of clay pot, rubber.

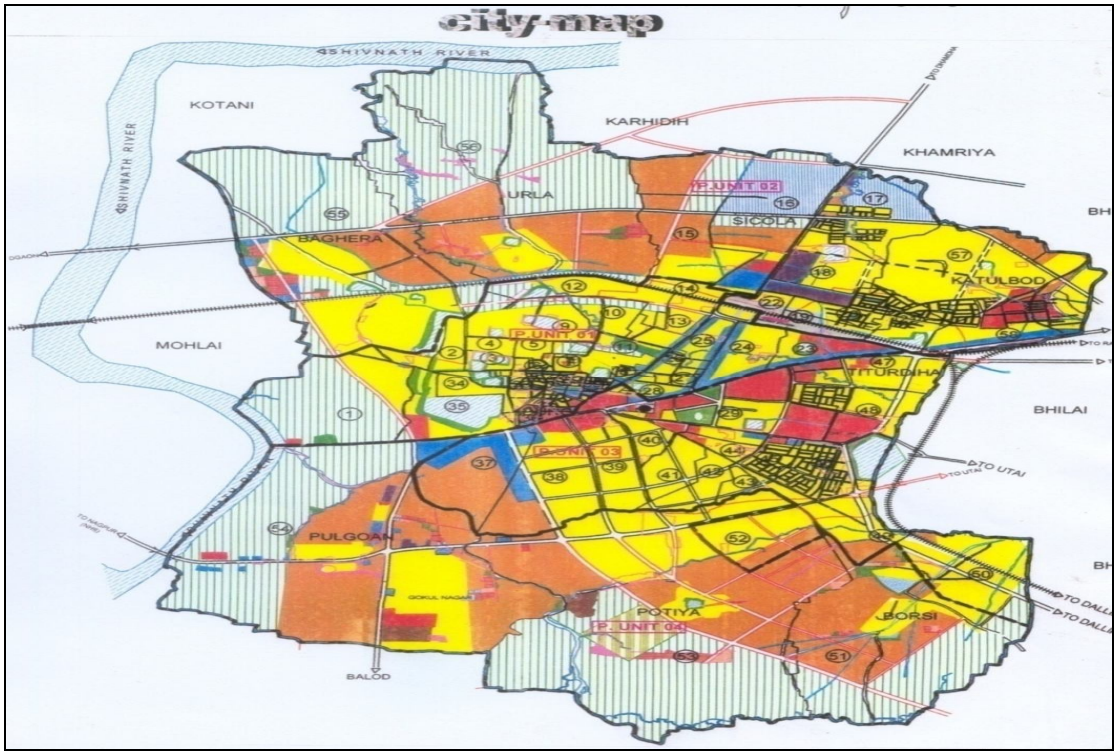

Figure 1

2.2. *Sampling & Sample Preparation*

Samples were taken [10 Nov. 2011] out from site in different depth, zero ft. one ft, two ft, three ft, four ft, five ft. After sampling, the sample was stepwise prepared for analysis. Traces of non-biodegradable materials like pieces of plastic and glass have been separated by prickling. The soil samples were dried at 40^0C up to one hour and sieved to ≤ two millimeters. The dried samples were grounded using mortar and pestle to particle size of ≤ 0.5 millimeters and then stored in air tight plastic bags. All tool materials to be used plastic or agate.

Figure 2: Potiya Site [10 Years Old].

2.3. Elemental Analysis of Soil Samples

Waste material is chemically composed of different group of organic compound such as carbohydrates, protein, lipids, or lignin components that are also present in natural ecosystem. [Rupert Baumler and Ingrid Kogel- Knabner 2006]. Temperature was measured on site during sampling. Salinity, pH, EC was measured with soil testing kit. Macronutrient (N, P, K,) and micronutrient (Ca, Mg, Zn, Fe, Cu, and Mn.) were measured with proper methods.[D. S. Abolude et al. 2009]. These characteristics also represent the biodegradability of soil by microorganism. Materials are analyzed by standard procedure given by using atomic absorption spectrophotometer. The physical and chemical properties of the solid waste material are presented in table; 1; 2, 3.

3. Results and Discussion

The chemical properties of open dump soil were determined, the results are shown in table 1,2, 3.

Open dump soil chemical properties show that it is neutral with a pH range from 7.50- 7.75. The highest pH is 7.75 in 4ft of soil, has slightly salinity is 4.1mmhos/cm in 5ft. The electrical conductivity (EC) is 3.052mmhos/cm in5ft of soil. Highest percentage of moisture is 19.98 in 2ft of soil. Open dump soil macronutrient constituents such as available Nitrogen (N), Potassium (K), and Phosphorus (P) are very high level 535.1kg./hec. in 5ft, and 1119.0 kg./hec. in 4ft, 27.77 kg./hec. in 4ft, respectively.[shown in table 2].Trace element concentration in open dump soil is shown in Table 3. The concentrations of calcium (Ca), magnesium (Mg), zinc (Zn), iron (Fe), copper (Cu) , manganese (Mn) are sufficient amount present in open dump soil. The trace element Ca, Mg, Zn, Fe, Cu, Mn are very high value 275 ppm in 5ft,130 ppm in 5ft, 11.50 ppm in 1ft , 11.54 ppm in 1ft, 4.90 ppm in 3ft, 32.40 ppm in 4ft of soil respectively. The open dump soil chemical properties are good, compared with standard value of compost criteria in order to assess the utilization of open dump as soil amendment. Chemical percentage composition of different depth (0ft, 1ft,2ft,3ft,4ft,5ft) of municipal solid waste soil shown in figure 1,2,3,4,5,6. The present study would suggest that municipal solid waste soil used as compost.

4. Conclusion

However, this research works examine the effects of municipal solid waste soil in Potiya site, with a view of creating environmental awareness for both the government and the public about the states of various dump site in the district Durg. MSW soil of Potiya has high concentration of N, P, K, high moisture content and high micro nutrient (Ca, Mg, Zn, Cu, Fe, and Mn) making composting the best treatment strategy. This result indicated that municipal solid waste soil had potential for recovery soil and its use for soil amendment.

5. Acknowledgements

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Annexure

Depth → / Properties ↓	0ft	1ft	2f	3ft	4ft	5ft
pH	7.50	7.50	7.50	7.50	7.75	7.50
Moisture %	11.032	18.43	19.98	17.9	13.44	19.24
Conductance	2.071	1.962	2.289	2.616	2.834	3.052
Salinity	2.7	2.6	3.0	3.4	3.7	4.1

Table 1: The Conductivity (m mhos /cm) and Salinity (m mhos / cm), pH in the Potiya site

Depth → / Properties ↓	0ft	1ft	2f	3ft	4ft	5ft
Nitrogen	275.3	279.3	240.1	270.3	275.3	535.1
Phosphorus	14.33	25.08	17.92	16.12	27.77	20.60
Potassium	1026.0	1049.0	1073.0	1046.0	1119.01	1083.0

Table 2: Concentration of Macronutrient (k.g/hec.) in Potiya site

Depth → / Properties ↓	0ft	1ft	2f	3ft	4ft	5ft
Ca	200	175	185	235	260	275
Mg	100	125	115	80	75	130
Zn	10.59	11.50	6.80	9.23	7.66	3.04
Fe	9.64	11.54	7.79	5.10	6.24	8.42
Cu	4.19	2.91	2.69	4.90	3.13	3.12
Mn	24.36	14.82	13.36	14.22	32.40	19.81

Table 3: Concentration of Trace element (ppm) in Potiya site

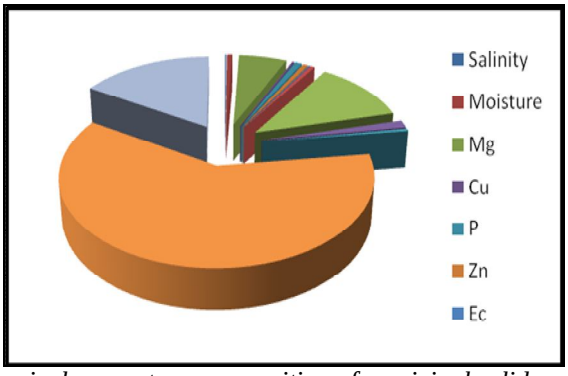

Figure 3: Chemical percentage composition of municipal solid waste soil in 0ft.

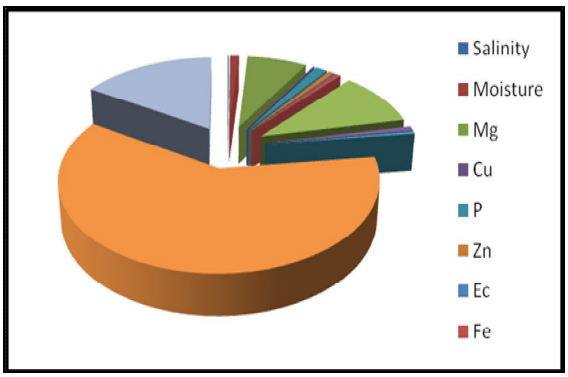

Figure 4: Chemical percentage composition of municipal solid waste soil in 1ft.

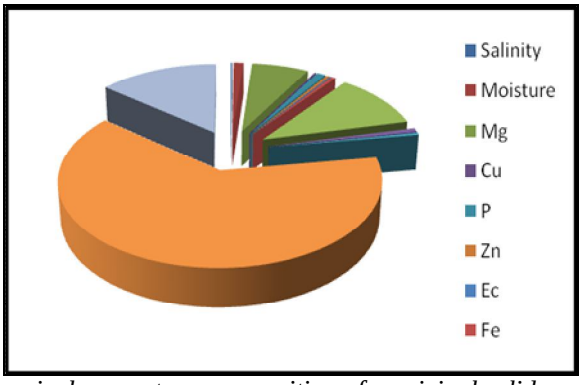

Figure 5: Chemical percentage composition of municipal solid waste soil in 2ft.

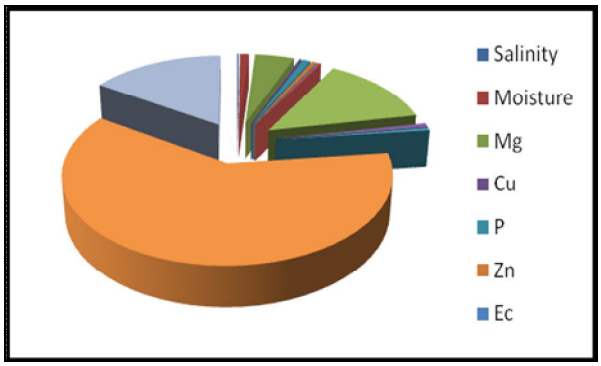

Figure 6: Chemical percentage composition of municipal solid waste soil in 3ft.

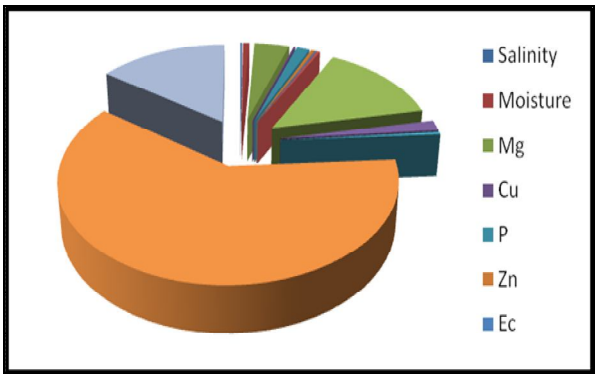

Figure 7: Chemical percentage composition of municipal solid waste soil in 4ft.

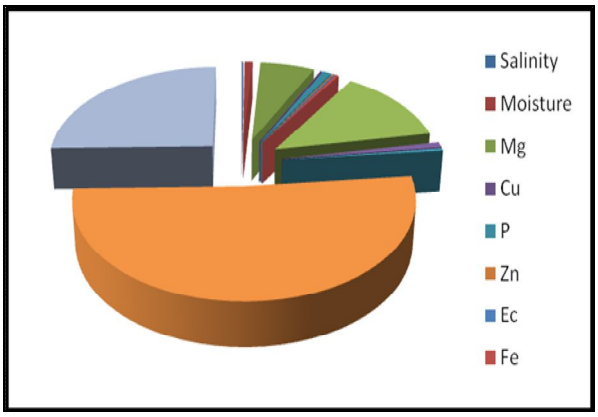

Figure 8: Chemical percentage composition of municipal solid waste soil in 5ft.