



## STUDY ON MUNICIPAL SOLID WASTE REFUSE CHARACTERISTICS AND LEACHATE SAMPLES OF COIMBATORE CITY

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### ABSTRACT

Characterization of municipal solid waste (MSW) and its leached liquid were carried out, which not only forms a key for an efficient solid waste management system and to assess potentiality of impairing the ecosystems, but also provide information about the rate and extent of decomposition of dumped waste. For the qualitative analysis, both the samples of solid waste and its leachate, were collected from the disposal site, analyzed and are presented in this paper.

### INTRODUCTION

The amount of municipal solid waste generated in Coimbatore city has been increased dramatically during the past several years. On an average, the city generates 800 MT per day of municipal solid waste from households, industries and manufacturing processes. Coimbatore Municipal Corporation, which is responsible for the collection and disposal of solid waste, is now facing problems associated with solid waste management system. As a result, 90 % of the total waste generated from the above sources are open dumped in city's disposal site near Vellalore causing danger to human health and environment. Assessment of future solid waste management requires accurate knowledge of the quantity and quality of solid wastes. Hence, the present study was carried out to have an idea about the quantity and quality of solid wastes generated in Coimbatore city. The data collected will help in deciding various processing techniques and waste management practices to be carried out for the solid waste in the city.

### MATERIALS AND METHODS

**Refuse analysis:** About 10 kg of representative samples of municipal solid waste was collected from the disposal site shown in Fig. 1. The waste was segregated to identify the individual components as shown in Fig. 2. The physical components of MSW are given in Table 1.

The non-biodegradable fractions were segregated and discarded and only degradable components were collected for physico-chemical analysis. These fractions were then air dried and finely grounded using a mixer and prepared for analysis as per IS: 9234-1979. The physical analysis and moisture content in the samples were determined as per standard methods of IS: 9235-1979. Chemical characterization of solid waste samples was carried out as per IS: 10158-1982 and the results are tabulated in Table 2.

**Leachate analysis:** Contaminants are released from the refuse to the infiltrated rain water, called leachate, by physical, chemical and microbiological processes and this could be a significant source of ground water pollution. (Kansal et al. 1998, Henry et al. 1987). Leachate from municipal landfills also represents health risk to surrounding ecosystems and human population (Owen et al. 1990). Leachate is chemically characterized by extremes in pH values, high BOD, high COD and the

Table 1: Physical characteristics of municipal solid waste.

Sl. No.	Components	% fraction
1.	Paper	5.696
2.	Plastics	8.698
3.	Garden trimmings and yard wastes	3.827
4.	Organic fraction (vegetable, fruit and food waste)	56.505
5.	Jute	0.987
6.	Wood pieces	1.924
7.	Stones, tiles and bricks	7.621
8.	Glass	0.389
9.	Metals	0.421
10.	Cloth, rubber	4.542
11.	Others	9.390

Table 2: Physico-chemical composition of municipal solid waste.

Sl. No.	Parameters	Values
1.	Moisture content %	57.00
2.	pH	7.1
3.	Volatile solids %	71.99
4.	Total Carbon %	22.02
5.	Total Nitrogen %	0.74
6.	Phosphorus as $P_2O_5$ %	0.43
7.	Potassium as $K_2O$ %	0.81
8.	C/N ratio	29.76
9.	Calorific value, kcal/kg	421

Table 3. Chemical characteristics of municipal solid waste leachate (Results expressed in mg/L except pH value).

Sl. No.	Characteristics	Sample I	Sample II
1.	pH	7.12	6.50
2.	Total organic carbon	8607	2214
3.	Total nitrogen	320	285
4.	Total phosphorus	1.55	0.81
5.	Ammonia nitrogen	2102	1824
6.	Chlorides	1526	1705
7.	Sulphates	3125	4321
8.	Total solids	8532	6238
9.	Volatile solids	7658	4995
10.	COD	12230	7147
11.	BOD	6500	5095
12.	Zinc	0.486	0.270
13.	Cadmium	0.051	0.021

presence of heavy metals (Keenan et al. 1984 ). High concentration of heavy metals in municipal solid waste leachate was reported by (Abduli & Safari 2001). To avoid environmental hazards due to the leachate, it should be treated properly. The estimate of leachate quality provides valuable information on the concentration of various chemical parameters and is of considerable importance in the design of collection system and treatment options. Characterization of leachate also helps in understanding the general processes of stabilization of waste materials in a landfill.



Fig. 1: Vellore waste disposal yard.



Fig.2: Segregated fractions of the collected municipal waste.

Leachate was sampled from the refuse dump site by collecting two samples of leachate from the same source at a time interval of six months, and the parameters analyzed are shown in Table 3.

## RESULTS AND DISCUSSION

The physico-chemical analysis of refuse enables us to know the quality of municipal solid waste. Result showed that the biodegradable fraction of MSW was high with an average value of 68.94 %. High percentage of volatile solid content also revealed that the organic content in the waste material was high. As high decomposable organic fraction with more moisture content generates methane even in open dumps; this energy can be tapped by subjecting to biomethanation process.

Composition of leachate showed varying concentrations between sample I and sample II. pH of both the samples was near to neutral value and all the other parameters showed wide variations in its strength. High value of COD in sample I indicates high organic content of leachate which may have high potential for polluting the receiving water. TOC concentration decreased in sample II as the stabilization time increases. The concentration of leachate constituents in sample II showed a reduction in its value due to increase in the age of refuse biodegradation.

## CONCLUSION

From the study, it was concluded that municipal solid waste has higher percentage of biodegradable fraction that can be utilized as an energy source by subjecting it to biomethanation process or can be composted. It was also concluded that the solid waste is amenable to the above said treatment process since the optimum C/N ratio was 29.76 which is within the range of 25 to 33.

Leachate samples showed stabilization of organic matter as indicated by the reductions in BOD, COD and TOC in sample II. But raw leachate showed high values of chemical parameters and should be treated to meet the effluent standards.

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