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CHARACTERIZATION OF SOLID WASTE IN GULBARGA CITY, KARNATAKA

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Abstract

In the present investigation reveals the physical and chemical composition of solid waste generated in Gulbarga city. The total 5 sampling sites were selected for the analyzing of solid waste material, out of which Vegetable market contain high amount of earth and ash components (54.30), followed by gravel and plastics. Thimmapur circle showed least amont of earth and ash (20.50), Gunj area and Super Market area consist of high amount of gravel and earth and ash materials. S B Temple area shown high occurrence of plastic material (4.50) followed by Vegetable market, Timmapur circle, Gunj and Super Market. Rubber material was completely absent in Gunj and Timmapur circle.

Key words: *Gulbarga City, Solid waste, Physic-chemical Properties*

Introduction

The world cities have undergone a rapid urbanization during the past fifty years. Urbanization in the world implies the modification of slum areas to the new cities or merging them to the existing adjacent cities. Population growth intensifies the pressure on urban infrastructure in many cities, which are already overburdened with the provision of urban services. Most of the world cities lack the resources to meet the demand for services such as water, sanitation and solid waste management. The insufficiency of services results in a deterioration of the urban environment in the form of air. water and land pollution that poses risks to human health and the environment[1]. Worldwide, over two-thirds of human wastes are released to the environment as sewage, often polluting surface waters and posing significant risks to human health. Solid waste management in developing countries has received r less attention from policy makers and demies than that paid to other urban environmental problems, such as air pollution and wastewater treatment. Municipal solid waste (MSW) refers to the materials discarded in the urban areas for which municipalities are usually held responsible for collection, transport and disposal. MSW encompasses household refuse, institutional wastes, street sweepings, commercial wastes, dead animals, construction and demolition debris'. In developing countries, MSW also contains varying amounts of industrial wastes from small industries and fecal matter. Uncollected waste may accumulate on the streets and clog drains when it rains, which may cause Hooding. Wastes can also be carried away by runoff water to rivers, lakes and seas, affecting those ecosystems. Low income communities tend to either dump their garbage at the nearest vacant lot, public space, creek, river or simply burn it in their backyards. Open dumping of solid wastes generates various environmental and health hazards. The decomposition of organic materials produces methane, which can cause fire and explosions and contributes to global warming. The biological and chemical processes that occur in open dumps produce strong leachates, which pollute surface and groundwater. Fires periodically break out in open dumps, generating smoke and contributing to air pollution. Human scavengers may also cause intentional fires, since metals are easier to spot and recover among the ashes after the fires than among piles of mixed wastes. Food leftovers and, kitchen wastes attract birds, rats, flics and other animals to the dumps . Animals feeding at the dumps may transmit diseases to humans living in the vicinity. Biodegradation of organic materials may take decades, which may limit the future use of the land on which open dumps are located. Collecting, transporting and disposing of MSW require a large expenditure. Waste management usually accounts for 30-50 % of municipal operational budgets. Despite these high expenses, cities collect only 50-80 % of the refuse generated.

Materials and methods

The present research work has been carried out under different categories. Disposal of urban solid wastes by landfill is the most widely practiced method in several Indian cities including Gulbarga

Gulbarga city urban solid waste USW is a heterogeneous material of different origins and characteristics. Fresh USW grab samples, weighing approximately 10 kg were collected from different locations of landfill sites. Similarly, stabilized solid waste samples were also collected from landfill sites so as to cover the whole area of the waste dump. The sample of 100 kg of waste thus collected was thoroughly mixed and by quartering technique, the weight of sample was reduced to 12.5 kg. Similarly, stabilized solid waste profile sampling was also done at five places of landfill sites at different depths (0-30, 30-60 and 60-90 cm) from the surface dump. The process of quartering was repeated till the weight of the sample was approximately 12.5 kg. Sample material from a waste layer above the surface of the soil was collected. Fresh solid waste represents the material disposed off at the landfill site within eight days of the date of dumping, whereas 'Stabilized waste' represents the material which was disposed off at the landfill site at least 180 days before the date of collection and has undergone decomposition. The stabilized solid waste samples were either collected from depths more than one meter from the surface or from places where wastes has not been dumped for the previous 180 days at the landfill sites

RESULTS AND DISCUSSION

Physical Composition:

The gravel content in various fresh samples of ranged from 6.20% (Timmapur Circle) to 20.00 % (Vegetable Market). The glass content varied from 0.50% (Timmapur Circle) to **1.10%** (S B Temple). The rags content varied from 0.70% (Super Market) to 7.00% (Gunj). The paper content varied from 0.80% (Super Market) to 2.15% (S B Temple). The metals in the urban solid wastes ranged from 0.80% (Super Market) to 1.30% (Timmapur Circle). The leather component ranged from 0.90% (Super Market) to 2.10% (Gunj). The rubber component ranged from 0.00% (Gunj & Timmapur Circle) to 2.40% (Vegetable Market). The plastics fraction in the urban solid wastes ranged from 1.00% (Gunj) to 4.5% (S B Temple). The earth & ash matter ranged from

20.50% (Timmapur Circle) to 23.85 % (S B Temple). The compostable matter ranged from 10.50% (Vegetable Market) to 37.10% (Timmapur Circle). The miscellaneous material content ranged from 4.20% (Vegetable Market) to 27.30 % (Timmapur Circle). The moisture content ranged from 11.00% (Vegetable Market**)** to 38.00% **(**Timmapur Circle**).** The density of wastes ranged from 10 kg. m^3 (Vegetable Market) 365 kg.m^3 (Timmapur Circle). The photographs of municipal solid waste dumping sites are incorporated in

Chemical characteristics and composition of urban solid wastes (USW): The physico-chemical analysis of urban solid wastes and waste profiles are presented in Tables -4.2. **pH**: All the refuse samples were alkaline (pH above 8.1) and **the** pH varied from 8.10 to 9.6 with an average of 8.72 ranges. Thus the waste profiles, are from neutral to alkaline. It ranged from **8.10** (Timmapur Circle), 8.3 (Super Market), 8.7 (S B Temple), 8.90 (Vegetable Market) and *9.6* (Gunj). **Conductivity measurements:** The conductance values of wastewater are in significant range, they also measured with depths. In waste profiles, it varied significantly from 130 $\mathbf{\Omega^{-1}cm^{-2}mol^{-1}}$ **(**S B Temple & Timmapur Circle), 147 $\mathbf{\Omega^{-1}cm^{-2}mol^{-1}}$ (Gunj), 266 $\mathbf{\Omega^{-1}cm^{-2}mol^{-1}}$ (Vegetable Market) & 288 $\mathbf{\Omega^{-1}cm^{-2}mol^{-1}}$ (Super Market). **Organic Carbon content:** The organic carbon content of wastes ranged from 3.4% to 6.3 % with an average of 4.25 percent. In waste profiles, it varied significantly from 3.4% **(S B Temple),** 3.6% (Vegetable Market) 3.75% (Timmapur Circle), 4.22% (Gunj) and 6.30 (Super Market) Organic Matter (OM): The Organic matter content of wastes ranged from 5.30 **to** 10.9 % with an average of 7.18%. In waste profiles, it varied significantly from 5.30% (S B Temple), 6.20% (Vegetable Market and Gunj), and 7.30% (Super Market) and 10.90 % (Timmapur Circle**).** **Chemical Oxygen Demand (COD):** The COD of the solid wastes varied from 89.0 to 112 with an average of 98.2%. In waste profiles, it ranged significantly from 89 (Timmapur Circle), 96 (Super Market and Gunj), 98 (S B Temple) and 112 (Vegetable Market). **Volatile matter.** The Volatile matter is in refuse samples ranged from 5.20 to 10.10% with an average of 6.64%. In waste profiles, it ranged significantly from 5.20% (Super Market), 5.40% **(Vegetable Market),** 5.80% **(Timmapur Circle),** 6.70% **(S B Temple**) and **10.10% (Gunj).**

Total Nitrogen: The total Nitrogen content of solid wastes ranged from **0.1** to 0.29 with an average of 0.18% In waste profiles, it ranged non-significantly from 0.10% (Super Market), 0.11 % (Vegetable Market), 0.16% (S B Temple), 0.24% (Timmapur Circle) and 0.29% (Gunj).

Total Phosphorus: The total phosphorus content of the refuse varied from 0.58 % to 0.85% with an average of 0.69% range. In waste profiles, it varied significantly from 0.58 % (Vegetable Market), 0.62% (S B Temple), 0.69% (Timmapur Circle) 0.75% (Super Market) and **0.85% (Gunj).**

Total potassium: The Total Potassium content of refuse ranged from 0.19 to 0.50 % with an average of 0.27 % range. In waste profiles, it varied significantly from 0.19 % (Vegetable Market), 0.20 % (Super Market), 0.21% Timmapur Circle), 0.28% (S B Temple) and 0.50% (Gunj).

Total Calcium: The total calcium content of Solid wastes ranged from 0.5% to 0.75 % with an average of 0.62 % range. In waste profiles, it varied significantly from 0.50% (Timmapur Circle), 0.55% (Gunj), 0.64 % (Vegetable Market), 0.68% (S B Temple**)** and 0.75% (Super Market).

Total Magnesium: The total Magnesium content of refuse varied from 0-52% to 0.21% with an average of 0.273% range. In waste profiles, it varied significantly from 0.50% (S B Temple), 0.12% (Vegetable Market), 0.14% (Timmapur Circle), 0.18% (Gunj) and 0.21% (Super Market).

Total Sodium: The total sodium content of wastes ranged from 0.06 to 0.15 % with an average of 0.11 % range. In waste profiles, it varied significantly from 0.60 % (Super Market), 0.07% (S B Temple), 0.12% (Timmapur Circle), 0.15% (Vegetable Market and Gunj).

Properties of urban solid wastes:

Physical composition of domestic and industrial wastes generated in urban areas. Sewage sludge does not form a component of the urban solid wastes generated in metropolitan areas because sewage is piped and disposed off separately in most of the cities in India ' The physical composition of urban solid wastes generated in Gulbarga city, is the area of these investigations is presented.

The unsorted, unshredded fresh urban solid waste from five landfill sites contained 6.2 to 20% gravel, 0.5 and 1.20 % glass, 0.7 and 7.0 % rags, 0.8 to 2.15 % paper, 0.8 to 1.30% metals, 0.9 to 2.1% leather and rubber, 1.0 to 18.5 % plastics, 23.83 to 54.30% earth and ash, 10.5 to 37.1% compostable matter, 18.20 to 27.3% miscellaneous matter, 11.0 to 30.0 percent moisture and 80 to 365 kg m^{-3} density respectively.

Olaniya and Saxena (1977) reported the physical characteristics of refuse from different dumping grounds of Jaipur (India) as 3.60-23.60% stone, 0.2-2.8% coal, 0.06-1.90% glass, 0.90-22.20% rages, 0.60-4.56 % papers, 0.01-1.70% metals, 0.16-0.30% hairs, 0.30-3.30% leather and rubber, 0.05-3.00% plastics, 0.07-0.50% bone, 18.30-46.90% compostable matter and 34.00-64.50% earth. Patel and Tiwari (1990) reported the characteristics of refuses from industrial areas of Rourkela. The mean value of different components were reported as 41.50% construction material, 47.70 % dust and cinder, 3.40% scrap metal, 1.10% paper and card board, 0.80% glass, 1.20% broken china, 1.00% mica, 1.00% polythene and 2.30% miscellaneous.

The non-compostable matter is more in Vegetable Market solid wastes and less in Timmapur Circle wastes. The compostable matter is more in Timmapur Circle and less in Vegetable Market. This is mainly due to the fact that the major portions of wastes generated are from market yards, public eating places like hotels, tea stalls and residential locations.

King et al., (1974) analyzed unsorted, shredded municipal refuse from St. Catherine's, Ontario, Canada which contained 71.20 % paper, 5.20 % plastic, 8.30% metal, 5.00% glass and dust, 1.30% miscellaneous and 48.6% moisture. This is clearly shows than the wastes generated in urban areas in western countries contained more paper, plastic, metal and glass than the waste generated at Gulbarga or other Indian cities[9'"].

Shaboo *et al.* (1997) studied the municipal waste from Karachi (Pakistan) and reported that it contained 89.50% (dry basis) total recyclable material with plastics 9.85%, paper 10.10 percent, glass with 1.24 percent, bones 1.85%, metal 0.74 percent, leather and rubber are with 0.20%, organic vegetable matter with 54.50% as the major components.

It is very difficult to compare the solid waste composition of a country with other cities on account of general scarcity of accurate, reliable and complete measurement on a comparable basis, difference in collection and disposal practice, geographical situation, capacity of land, seasonal variation in waste production and characteristics including standard of living and economic conditions[94-95]

Gulbarga is one of the rapidly growing cities in Karnataka and there is a lot of construction activity. Also as the surroundings of the city are barren without a green cover, the winds blowing into the city transport a lot of dust. The presence of higher quantities of earth (soil) and ash in urban solid waste of many Indian cities is due to a collection system wherein the street sweepings are mixed with refuse. Studies conducted by Bhide (1984) showed that the earth and ash content in waste exhibited a decrease with an increase in population density in Indian cities. The relative contribution of paper, metals, plastics and glass in Gulbarga urban solid wastes is low as compared to refuse from western countries, which is because of salvaging of these components for recycling from the waste bins provide in the streets or at the landfill site[98]. It is estimated that few hundred persons are engaged in salvaging of wastes components for recycling to make a living out of the avocation at Gulbarga. In this respect, the situation with regard to waste disposal problems is better in Indian cities as compared to industrialized and advanced countries where such salvaging and recycling of waste components is non-existent, thus, creating serious environment problems in respect of disposal of waste components like metal, paper, plastics, glass and rubber[99, 100]

Detailed analysis of the physical composition of wastes helps in the selections of a suitable disposal system. At this stage it is worth while to state that some of the states in India (Maharastra, Karnataka) have banned the use of carry bags and few other plastic materials like disposable tins, cups, bottles etc 4.4.1. Physico-chemical properties:

Data presented in Table 7 provide some of the physico-chemical and chemical properties of USW only. Detailed study of results gives many interesting insights regarding the chemical nature of solid wastes from Gulbarga city.

The urban solid wastes samples were slightly alkaline to strongly alkaline in reaction and the pH ranged from 8 20 (Timmapur Circle) to 9.60 (Gunj). Bhide and Muley (1973) reported pH of Nagpur city refuse as 7.90. Mutatkar (1985) reported that pH of the Indian city refuse ranged from 7.68 to 8.40. Olaniya and Saxena (1977) reported a pH range of 7.20 to §.20 for Jaipur city refuse. In Rourkela industrial city, the pH of the urban solid ranged from 6.80 to 7.40. Bhide and Sundaresan reported that in Indian city refuse the average pH were 7.68. Gupta et. al., (1984) studied the Calcutta city waste and reported that the refuse were neutral to alkaline in reaction. Gupta et al., studied the nature of waste compost obtained from urban wastes of Calcutta and reported that the pH is neutral to slightly alkaline in reaction, ranging from 7.50 to 8.10. For Bombay city wastes, the pH reported was 7.70.The pH of wastes mainly depends on the source and characters which will affect physical composition of wastes[1] . In genera], urban solid wastes are usually alkaline in reaction due to presence of CO_3", HCO3", Na, K and other alkaline materials in varying concentrations.

The electrical conductivity of wastes varied greatly. It ranged from 130 $\Omega^1 cm^2 mol^{-1}$ (Timmapur Circle and S B Temple) to 266 $\Omega^1 cm^2 mol^{-1}$. Vegetable Market) in 1:50 waste water extracts. Significant differences in EC were observed from one landfill site to other. Gupta et al (1986) reported that the EC for Calcutta city waste composts ranged from 1.04 to 2.05 $\Omega^1 cm^2 mol^{-1}$ in 1:2 waste water extracts.

The two hazards most often encountered in wastes are high total salts and sodium content levels. High Na levels and K, to a lesser degree, cause dispersion of soil practices, poor soil structure and reduced infiltration rates. Therefore, the nature of salts as well as application rates should be considered while using wastes on agricultural land.

The organic carbon contents of wastes ranged from 3.40% (S B Temple) to 6.30 % (Super Market). Organic carbon contents in Super Market site was more due to the fact that they contain more vegetable, market yard hotel waste and wastes generated from residential areas of the city as compared to other sites. Mutatkar reported that the organic carbon content of Indian city refuse varied from 12.0 to 15.30. Nandkishore reported organic carbon content of 18.90 % for Jaipur city refuse. Patel and Tiwari reported organic carbon from 19.80 to 33.80 % for Rourkela industrial city waste.

King *et.al.,* reported organic carbon content of Ontario refuse as 37.00 per cent.Talashilkar and Vimal reported organic carbon content of Delhi city compost as 14.50 per cent. Bhide and Muley reported organic carbon content for Nagpur city refuse as 18.87 per cent. Gupta et al., reported that the organic carbon content of Calcutta city waste ranged from 8.50 to 10.0 per cent. Gupta et al reported organic carbon content of Calcutta city wastes composts ranged from 7.20 to 7.80 per cent. Ramachandran and D'Souza reported organic carbon content of Bombay city wastes as 10.04 per cent. The organic carbon content varies with the source of collection of urban solid wastes. The content of organic matter in solid wastes is very critical to evaluate its suitability for composting [03; l04]. Higher the organic carbon content better is the waste for composting and subsequent use as manure['05] In this respect the Super Market solid wastes are more suitable for treatment through composting.

Chemical Properties:

The organic matter in wastes ranged from 5.30 (S B Temple) to 10.90 % (Timmapur Circle). This is considered to be low when compared with reported organic matter contents of wastes of a few other Indian cities. Bhide and Muley reported organic matter content of Nagpur city refuse as 32.54 per cent. Olaniya and Saxena reported 32.80 % of organic matters for Jaipur city (India) refuse, whereas Patel and Tiwari (1990) reported 34.20 to 58.30 % organic matter with Rourkela city wastes. Mutatkar (1985) reported the organic matter content of Indian city refuse ranged from 20 to 30 per cent- It varied with all the parameters that affect the physical composition of the urban solid wastes. The lower organic matter content of the Gulbarga city wastes is probably due salvaging of waste components like paper and rags and also because of high content of fine earth and ash which reach the waste through sweepings from streets and homes.

The Chemical Oxygen Demand (COD) of Gulbarga city wastes ranged from 89.0 (Timmapur Circle) to 112.0 (Vegetable Market) mg g^{-1} .Olaniya and Saxena (1977) reported COD as 528 mg $g^{-1}$for Jaipur city waste. Nandkishore (1980) reported COD values of Bangalore city waste compost as 278.0 mg g^{-1}. This parameter is largely dependent on organic matter content and its extent of decomposition in the urban solid waste[106] The COD estimation helps in evaluating the maturity of refuse during composting. In fresh wastes, the C.O.D. content will be more than the stabilized wastes because of the extent of decomposition of organic matter in stabilized wastes.

The Total Nitrogen content ranged from 0.1 (Super Market) to 0.29 % (Gunj) in solid wastes. Olaniya and Saxena reported total nitrogen content. of 0.67% in Jaipur city wastes. Bhidc and Muley reported N content of Bangalore city waste compost as 0.58 per cent. Patel and Tiwari reported total N content of 0.49 to 0.87 in Rourkela solid wastes. Gupta et al (1984) reported total nitrogen content of 0.60 % in Calcutta city wastes composts. Nitrogen in waste is largely contributed by the organic matter fraction and is therefore directly proportional to the organic matter content of wastes.

The Total Phosphorus content of wastes ranged from 0.62 (S B Temple) to 0.85 % (Gunj and Vegetable Market), whereas it ranged from 0.43 to 1.67 % in Rourkela city wastes. Olaniya and Saxena (1977) reported P values of 0.62 % in Jaipur city refuse. Gupta *et al.,* reported total P content of Calcutta city waste composts as 0.28 to 0.31 per cent. Bhide and Muley reported total P content of Nagpur city refuse as 0.867 %. Mutatkar reported the P content of Indian city refuse varied from 0.60 to 0.72 percent. The main source of P in USW is the organic matter and other in organic materials like fine earth metals, ash, rubber and other components.

The Total Potassium content in Gulbarga city wastes ranged from 0.2 (Super Market) to 0.50 % **(**Gunj). Bhide and Muley (1973) reported total K content of Nagpur city refuse as 0.842%. Olaniya and Saxena (1977) reported values of 0.70 % for Jaipur city refuse. Mutatkar (1985) reported the K content of Indian city refuse varied from 0.60 to 0.72 per cent. Gupta et al reported total K content of Calcutta city waste composts as 1.67 to 2.79 per cent. Talshilkar and Vimal (1985) reported total K content of Delhi city waste compost as 0.70 per cent. The main sources of K in wastes are organic and inorganic materials like soil, fine earth, ash, vegetable matter, metals and other components.

The Total Calcium and Magnesium contents of wastes ranged from 0.5 (Timmapur Circle to 0.75 (Super Market) and 0.12 (Vegetable Market) to 0.21 % (Super Market) respectively. The main source of these two elements is organic matter and fine earth, ash and other components.

The Total Sodium content of wastes ranged from 0.06 (Super Market) to 0.15 % (Gunj). Gupta et al., (1984) reported total Na content of Calcutta city wastes as 0.30 to 0.38 per cent. The sources for this element are organic matter fine earth, ash and inorganic salts. The Na content of urban solid wastes should be carefully monitored and management practices should be followed that will keep the Na content of the wastes as low as possible, particularly if the wastes are being used as manure either fresh or after composting.

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Table-1: The details of the landfill sites.

S. No.	**Location of the Landfill site**	**Area in Acres**	**Approximate quantity of USW**	**Landfill age in**
1.	Super Market	**15**	Dumping was stopped	**20**
2.	Gunj	**20**	600-800	**10**
3.	Timmapur Circle	**20**	600-800	**08**
4.	Vegetable	**05**	Dumping was stopped	**10**
5.	S B Temple	**15**	400-600	**15**

Table 2: Methods for chemical analysis of Urban Solid Wastes.

S.	Test	Out line of the	Reference
1.	pH	10 gr of the sample is placed in a flask and 500 ml distilled water was added and stirred for 3 to 5 minutes. The	Indian Standards Institution -
1.	Electrical	Same sample after determination, of pH was used and with **the** help of	Stewart and meek (1977)
3.	Organic Carbon	**Chromic** acid wet digestion method (Walkey and Black) with out the correction for total recovery, where 0.5 g of waste sample is placed in the flask and 20 ml of 1 N $\mathbf{K_2Cr_20_7}$ is added. Then 40 ml of $H_2SO_4$is added	Jackson (1965)
4.	Organic Matter	o.m.=% organic carbon X 1.724	**-Do-**
5.	Chemical Oxygen Demand (COD)	Chromic acid wet digestion method as **in** O.C **determination.** C.O.D. $\mathbf{mg^{-1}}$ = (Blank **T.V.ml-sample T.V.ml) X N** of **ferrous** ammonium sulphate Xeq. Wt	**Indian** Standards **Institution: 10158**

6.	Volatile Organic	**About** 5g of finely ground sample was placed in a constant silica dish and heated in an electrical furnace up to a temperature of 600 °C and for 2 hours.	-Do- |
7.	Total Nitrogen	About 5 g sample digested and distilled with NaOH 40 % and	-Do-
8.	Total Phosphorous	l.0 g sample + 5 ml of H_2SO_4+ 5ml of **HNO_3** and heated. 10ml H2O2 added and heated and digested in HF. Vol. is made to 250ml. This aliquot is used for analysis formation of	-Do-
9.	Total Potassium	l.0 g sample is decomposed by 5 ml H_2SO_4 + 5ml HNO_3 mixture and 10	-Do-
10.	Total Calcium and Magnesi	1.0 g sample is weighed and lO.ml HNO_3 + 3ml $HC1O_4$ (60%) added and heated on hot plate. Cooled and added 10 ml HC1 (1 + 1) and quant is	AOAC (1980)
11.	Sodium	Estimated by Flame Photometer after proper dilution	-Do-

Table-2: Physical composition of solid waste generated in Gulbarga city:

Characteristics	Super Market	Gunj	Timmapur Circle	Vegetable Market	S B Temple
Gravel	15.00	12.50	6.20	20.00	18.00
Glass	1.10	1.00	0.50	1.00	1.20
Rags & Textile	0.70	7.00	2.10	1.00	
Papers	0.80	2.00	2.00	1.10	2.15
Metals	0.80	1.00	1.30	1.00	1.10
Leather	0.90	2.10	1.60	1.40	1.60
Rubber	2.00	-	-	2.40	1.60
Plastics	1.20	1.00	1.40	3.10	
Earth & Ash	37.00	35.00	20.50	54.30	23.85

Compostable matter	31.00	20.00	37.10	10.50	25.00
Miscellaneous	9.50	18.40	27.30	4.20	16.00
Moisture	30.00	27.00	38.00	11.00	22.00
Density Kg m	265.00	10.00	365.00	80.00	150.00

Note: All values in percent by dry weight

Table-3: Physico-chemical composition of solid waste generated in Gulbarga city:

Characteristics	Super Market	Gunj	Timmapur Circle	Vegetable Market	S B Temple
pH	8.3	9.6	8.1	**8.9**	8.7
EC (Q~'cm^{2}mor^{l})	288	147	130	266	130
Organic carbon	6.30	4.22	3.75	3.60	3.40
Organic matter	7.30	6.20	10.90	6.20	5.30
COD	96	96	89	**112**	98
Volatile Organic	5.20	10.10	5.80	5.40	6.70
Total Nitrogen	0.10	0.29	0.24	0.11	0.16
Total Phosphoro	0.75	0.85	0.69	0.58	0.62
Total Potassium	0.20	0.50	**0.21**	0.19	0.28
Total Calcium	0.75	0.55	0.50	0.64	0.68
Total Magnesium	0.21	0.18	**0.14**	0.12	0.15
Total Sodium	0.06	0.15	0.12	0.33	0.07