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## Distribution and moisture content of municipal solid waste in different wards of Kanpur city, India

**Shailendra Nath and AR Siddiqui**

### Abstract

This paper deals with the characteristics and composition of municipal solid waste (MSW) generated in selected ward of Kanpur. The composition of solid waste was studied by segregating it into different component to assess the percentage distribution in the biodegradable waste. The main component of biodegradable waste includes paper, card board, food waste, clothes, miscellaneous waste and monthly moisture content of biodegradable materials. The analysis of waste indicates that food waste generation is more as compare to Paper and Cardboard. Paper reported 15.48 percent, Cardboard 18.86 percent, Food waste 23.41 percent, Clothes 12.82 and 29.43 under miscellaneous category. Biodegradable waste moisture content observed in month of September (26.01 %) and minimum in (15.3%) in February. The increasing trend of moisture content was observed from month of august to November.

**Keywords:** Municipal waste, moisture content, biodegradable, non-biodegradable waste

### Introduction

Now day's municipal solid waste in urban area highly serious problem in developing countries. Urban areas of developing countries are facing severe problems to handling and proper management of generated waste material from household. The quantity of urban waste materials increases with the increase of population and fastest urbanization. In many modern cities particularly in the metropolises of major developing countries, however, the traditional solid waste disposal practices seen as improper, ineffective and inadequate.

The solid waste generation is directly related with increase of population, industrialization, urbanization, changing life style and standard of living pattern, fooding habits and the way of life towards consumerism which rises the quantity of solid wastes and enhanced the problem associated with solid waste management (Sharma and Chand, 2010) [6].

In many modern cities particularly in the metropolises of major developing countries, however, the traditional solid waste disposal practices seen as improper, ineffective and inadequate. (Nath and Siddiqui, 2008)

TEERI (1998) has defined municipal solid waste in different perspective. It defined as all solid wastes generated in a community except Industrial and agriculture waste Even though some attempts have been undertaken to collect and to dispose waste though landfill and incinerator, Whereas some thrown open dumps or leftover especially in developing countries. Such practices may increase pressure to environment such as an pollution, water pollution, land pollution and may increase threat to human health (Sembiringand Nitivattananon, 2008) [9]

The problem related to generation and management of solid waste is now in alarming position. People need more awareness about waste minimization and 3 R concept (reduce, reuse and recycle) at level of households

### Material AND Methods

#### Location and Extent of the Study Area

Kanpur City is situated between the parallels of 25°26'N and 26°58' North latitude and 79°31'E and 80°34' East longitude. It is situated on the most important national highways no. 2 and 25 and state highway. Covering an area of 291.78 Square Kilometers which consist 34, 15, 058 persons (as per 2010 projected population). Kanpur is the biggest city of the state and it is the main centre of commercial and industrial activities formerly known as Manchester of the country is now also called the commercial capital of the State. It is known for its cotton and woolen textile and leather industries. Apart from leather and textile industry, the fertilizer, chemicals, hosiery, two wheelers and engineering industries are also operating prominently in the city. Kanpur city is divided into six zones and further subdivided into 110 wards.

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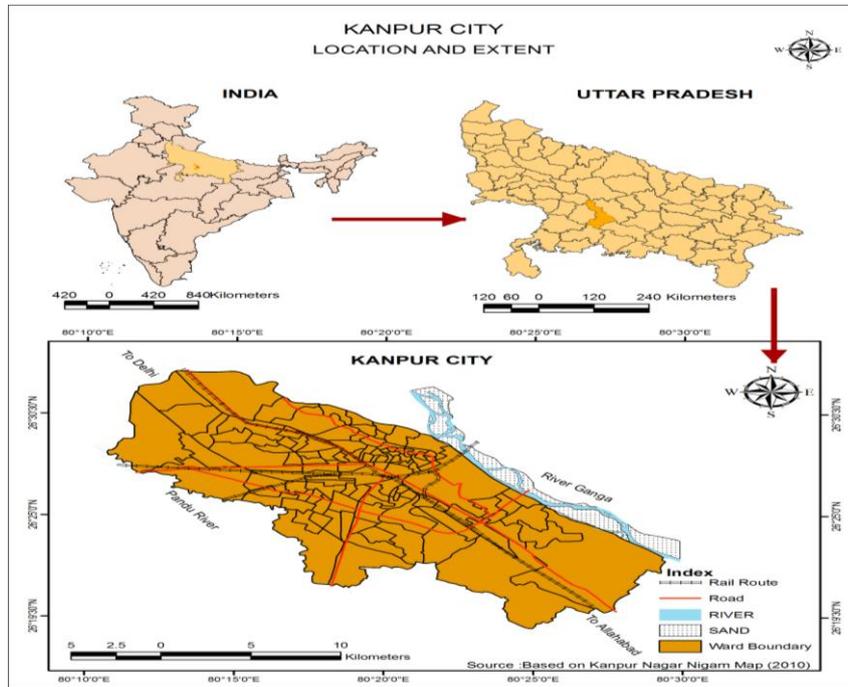


Fig 1: Map of Study area

**Climatic Characteristics**

The climate of Kanpur is typical humid and sub-tropical type. The general climatic condition of Kanpur reported very hot summers, mild and relatively short winters and season of rains. Kanpur lies in the northern plains of India which witnesses extremes of temperature. It can drop to a minimum 0°C in in the winters while it reaches up to 48°C in summers. Kanpur experiences severe fog in the month of December and January. In summer excessive dry heat is accompanied by severe dust storms and 'loo'.

**Study Site**

Present research was conducted in selected wards of Kanpur city in zone 2 during the period of January to December 2010. Zone No. 2. Located in eastern margin of the city. It covers an area of 112.81 Square Kilometers and consist nearly 6, 80, 165 persons. It has 18 wards namely Chakeri, Sanigavan, Krishna nagar, Gaukhera, Naubasta east, Harjinder Nagar, Hanspuram, Ompurwa, Pashupati nagar, Dheli Sujanpur, Jajmau, Sauth, Yashoda Nagar Block P, Tiwaripur, Gandhi Gram, Sujat Gunj, Jajmau Nath, Yoshoda Nagar West and Chandari.

Table 1: Number of ward, population and households in Zone 2

Zone No. -2	Total Population of the Zone	Total Area of the Zone	% of total area of Kanpur city	Total No. of Household	Household Density	Name of The Ward's
	680165	112.81	38.66	77683	689	Chakeri, Sanigavan, Krishna Nagar Block-11, Safipur, Naubasta East Harjender Nagar, Hanspuram, Om Purwa, Pasupati Nagar, Dheli Sujanpur, Jajmau south, Yashoda Nagar, east, Tiwaripur, Gandhi Gram, Shyam Nagar, Jajmau north, Yashoda Nagar West, Chandari

**Sampling Period**

Random sampling was performed during the period of January to December, 2010 with interval of one month at selected wards of zone 2 in Kanpur city (Table 1).

**Sample analysis**

Representative samples were collected for characterization, quantification and moisture content in biodegradable waste. The following formula were used for determine the moisture content in the biodegradable waste materials.

$$Mc = (Ww - Wd) / Ww \times 100$$

Where, Mc = moisture content (%),  
 Ww = wet weight of the sample, and  
 Wd = dry weight of the sample.

**Result and Discussion**

The solid waste Sample was collected from five wards namely Chakeri, Hanspuram, Jajmau, Yashoda nagar and Gandhigram from the period of January to December 2010 at interval of one month (Fig.2a and 2b). The collected sample was sorted in two category are biodegradable and non-biodegradable for further analysis. It is observed from Table 1, that composition of biodegradable waste indicated that there are food waste generation is more as compare to Paper and Cardboard waste. Paper waste is 15.48 percent, Cardboard 18.86 percent, Food waste 23.41 percent, Clothes 12.82 and 29.43 under miscellaneous category. The maximum percentage of paper waste was observed in month May (17.43) and minimum in month of January (12.19). The waste cardboard found maximum in month of January (28.11) and

then decreasing trend was observed in upcoming months and reaches up to (14.52) in month of December followed by food waste in month of December (26.30) and minimum (18.29) in month of February. The clothes waste observed maximum in month of March (15.70) and minimum (9.87), maximum miscellaneous wastes observed in month of October. The variability of percent distribution of biodegradable waste were affected due climate, lifestyle, waste collection time and seasonal variability. It has been observed that Hanspuram and

Jajmau reported high concentration of Cardboards, paper and food waste whereas concentration of Cloths and miscellaneous waste is higher in Jajmau, Gandhigram and Yashoda Nagar. Jajmau, Gandhigram and Yashoda Nagar reported for high concentration of Cardboard and Paper due presence of small scale industries and metallurgical units. Similar study was conducted by other authors (Sharholi *et al.*, 2008; Singh *et al.*, 1999; Kansal *et al.*, 1998; Nath and Siddiqui, 2018) [5, 10, 1, 7]

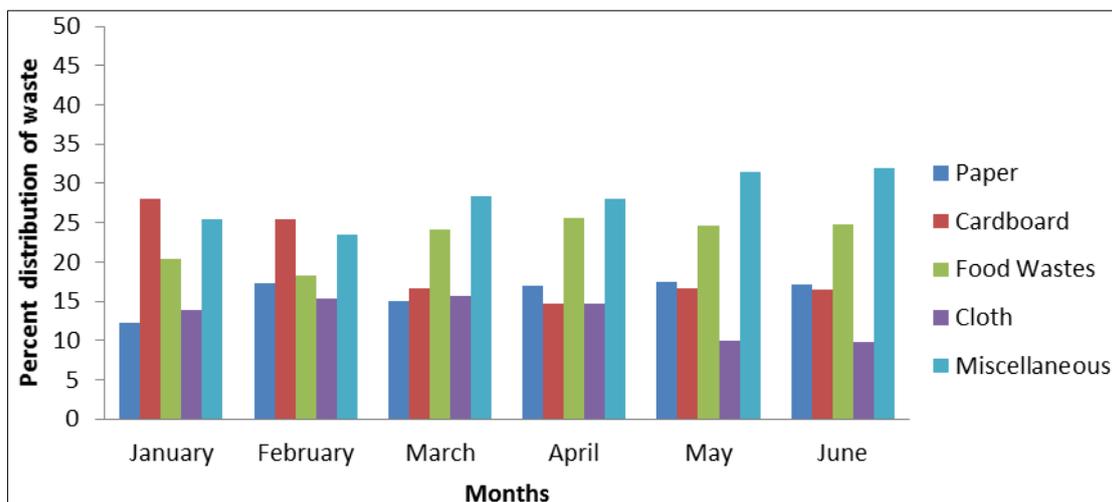


Fig 2a: Composition and percent distribution of biodegradable waste in month of (January-June, 2010) in Zone-2

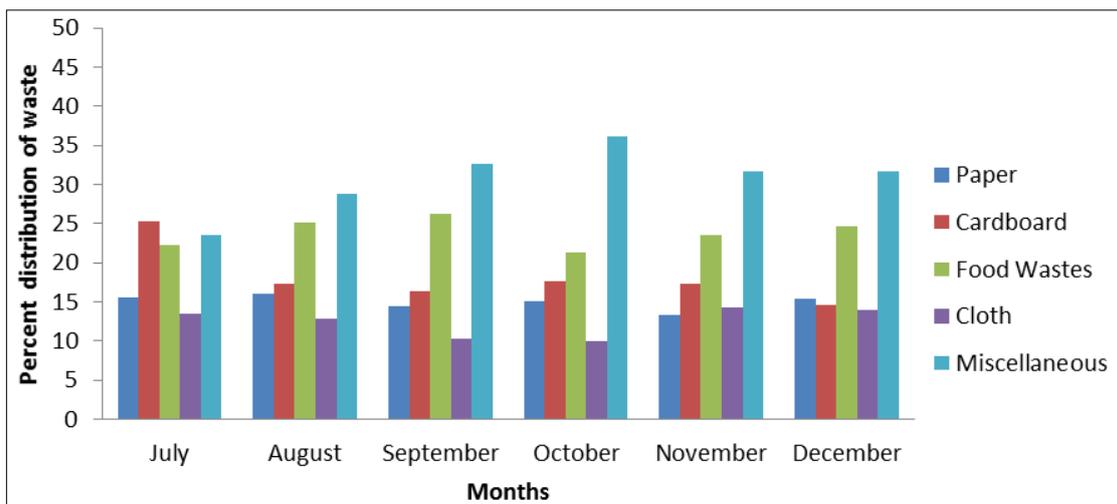
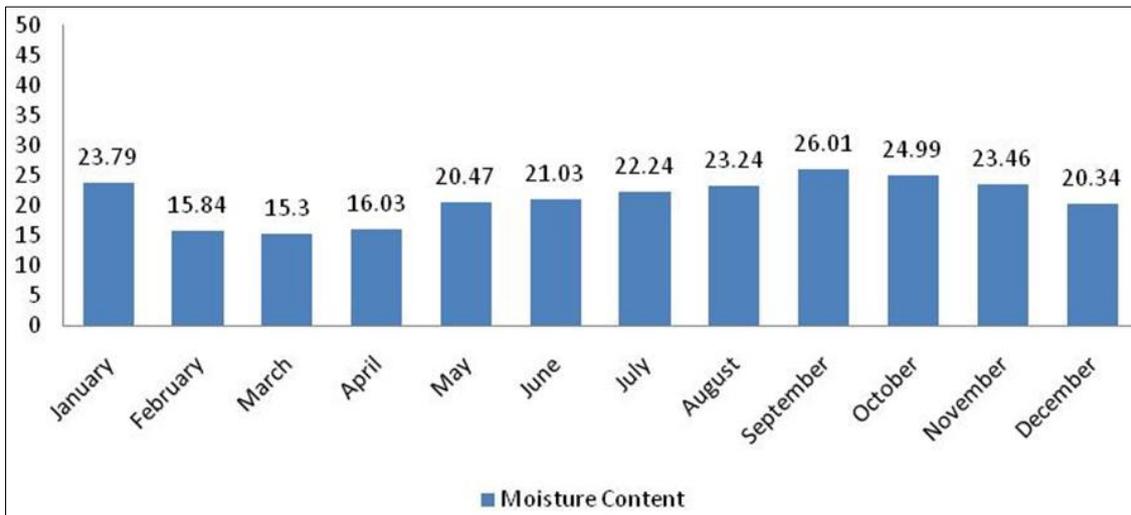


Fig 2b: Composition and percent distribution of biodegradable waste in month of (July –December, 2010) in Zone-2

Table 1: Percent distribution of biodegradable waste and moisture content in Zone-2

Composition and percent distribution of Biodegradable waste in Zone 2						
Months	Paper	Cardboard	Food Wastes	Cloth	Miscellaneous	Moisture Content
January	12.19	28.11	20.46	13.86	25.37	23.79
February	17.36	25.50	18.29	15.41	23.44	15.84
March	15.09	16.62	24.15	15.70	28.44	15.30
April	16.98	14.70	25.54	14.69	28.08	16.03
May	17.43	16.57	24.68	9.90	31.41	20.47
June	17.06	16.42	24.72	9.87	31.94	21.03
July	15.63	25.24	22.23	13.41	23.50	22.24
August	16.04	17.29	25.09	12.79	28.80	23.24
September	14.37	16.40	26.30	10.23	32.70	26.01
October	15.00	17.60	21.34	9.95	36.12	24.99
November	13.29	17.32	23.52	14.21	31.66	23.46
December	15.36	14.52	24.57	13.88	31.68	20.34
Annual Average	15.48	18.86	23.41	12.82	29.43	21.06



**Fig 3:** Moisture content in biodegradable components of solid waste in Zone 2

It can be observed from figure 3, showed the monthly variation of moisture content (%) in biodegradable waste (paper, card board, food waste, clothes and miscellaneous waste). The range of moisture contents varied between 15.3% to 26.01%. The maximum moisture content observed in month of September (26.01 %) and minimum in (15.3%) in February. The increasing trend of moisture content were observed from month of august to November, the possible reason of increasing moisture content in waste due to influence of monsoon season and decreasing trend were observed form February to March. The situation is worst during monsoon period in low lying areas. (Sharholly *et al.*, 2008; Malviya *et al.*, 2002; Nema, A.K., 2004; Rao and Shantaram, 1993; Nath and Siddiqui, 2018) <sup>[5, 7, 2, 3, 4]</sup>

### Conclusion

Based on the analysis of biodegradable materials. Indicates that food waste generation is more as compare to Paper and Cardboard. Paper reported 15.48 percent, Cardboard 18.86 percent, Food waste 23.41 percent, Clothes 12.82 and 29.43 under miscellaneous category. Biodegradable waste moisture content observed in month of September (26.01 %) and minimum in (15.3%) in February. The increasing trend of moisture content was observed from month of august to November, from the present research observation indicated that need more awareness about waste minimization and 3 R concept (reduce, reuse and recycle) in the society.

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