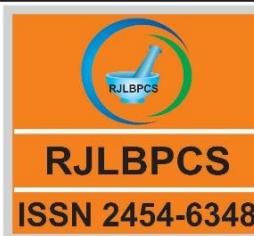


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COMPOSITION OF MUNICIPAL SOLID WASTE ACCUMULATED IN VELLAJOR DUMP YARD FROM COIMBATORE CITY

M. Soumiya, M. Balakrishnan, K. Shanthi*

Department of Environmental Science, PSG College of Arts and Science, Coimbatore, India.

ABSTRACT: Municipal solid wastes are mixtures of both organic (wet waste) and inorganic (dry waste) within a geographical boundary. Coimbatore being a metropolitan city large bulk of wastes is collected and disposed at the dump yard. This investigation was performed to monitor the fluctuation in the waste composition during different seasons. From this research, it is clear that the people of Coimbatore depend on plastics in their daily life resulting in major contribution of waste. To manage a proper disposal the mountainous wastes should be disposed efficiently by means of sanitary landfills, pyrolysis and incineration than the usual landfill which is a menace to the environment. Incorporating E – waste and Bio – medical waste along with other inorganic wastes gives rise to environmental pollution. The organic portion of the municipal solid waste will become a boon for farmers and agriculturists as they can be transformed into a soil fertility medium by employing composting technique.

KEYWORDS: Organic Waste, Inorganic Waste, Plastics, Food Waste, Composting, Landfill.

Corresponding Author: Dr. K. Shanthi*Ph.D.

Department of Environmental Science, PSG College of Arts and Science, Coimbatore, India.

Email Address: shanthivis@gmail.com

1. INTRODUCTION

Municipal Solid Waste (MSW) includes commercial and residential wastes generated in municipal or notified areas, in either solid or semi-solid form excluding industrial hazardous wastes [1]. The quality and quantity of MSW generated by a particular community vary according to their socioeconomic status, cultural habits, urban structure, population and commercial activities Government bodies at all levels-central, state and local bodies- and some non-governmental

organizations (NGO) are taking proactive steps to tackle the issue of managing MSW. Dramatic increase in municipal solid waste (MSW) due to more population and change lifestyle in the country [2]. 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 wastes generated from the above sources are dumped openly at city's disposal site near Vellore causing danger to human health and the environment. Assessment of future solid waste management requires accurate knowledge of the quantity and quality of solid wastes [3]. The article deals with the composition of municipal solid waste collected from the Vellore dump yard and its density obtained seasonally.

2. MATERIALS AND METHODS

STUDY AREA

Vellore is a Panchayat town in Coimbatore district in Tamilnadu which is located at 13 km east of the Coimbatore city (Figure 1) situated on the southern bank of Noyyal River. Population census states that, as per the year 2001 population rate is about 17340 and at the year of 2011 population rate is 32230 and now it is in the range of 35000. For years, the entire solid waste as well as sewage of Coimbatore city has been dumped in the Vellore yard. It was reported that 1000 tonnes of garbage get disposed day by day within the corporation limit of Coimbatore. Around 5 lakh million tons of waste accumulating over a year, due to the practical difficulties on the segregating the wastes and composting the solid waste forming such bigger and bigger mountains on the waste land [4].

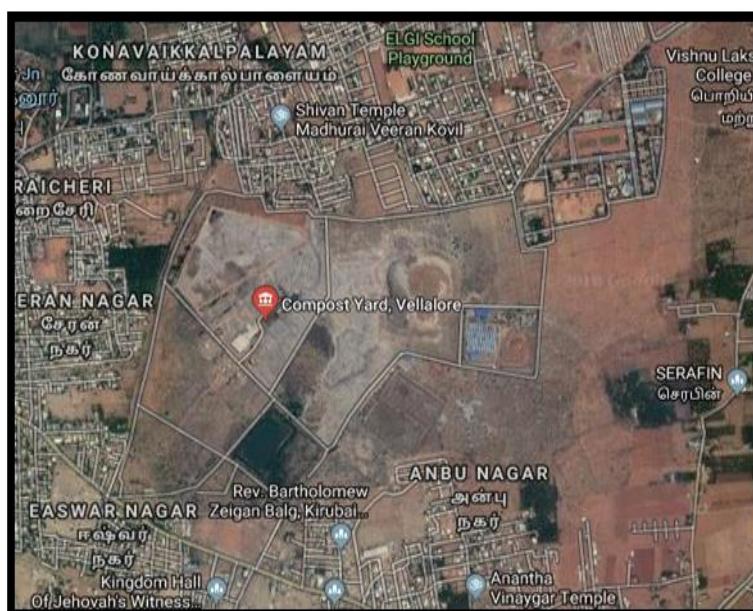


Figure 1: Location of Vellore Dump yard

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Sample Collection

The samples were collected from Vellore dump yard in four different seasons, i.e., Monsoon (June), Post Monsoon (October), Winter (January) and Pre Monsoon (March). Following an earlier study [5], approximately 30 kg of sample was collected using the quartering technique without compromising the prevailing composition of solid waste components. Then the reduced sample was sorted out manually into various components. Subsequently, the weight and volume of each component were measured and recorded.

3. RESULTS AND DISCUSSION

Municipal solid waste is a heterogeneous mixture of solid materials which does not have any use to society. Food waste, plastic, paper, rubber or leather, glass and textiles are the common MSW components. Usually municipal solid waste can be broadly categorized into organic or inorganic waste using major components of the solid waste composition. Organic waste is also known as wet waste, whereas inorganic waste is also known as dry waste. Inorganic waste includes both recyclable and non-recyclable materials whereas organic waste includes all the waste components, which can degrade in a natural environment like leftover food, vegetable and fruit peel [6]. Waste quantity and composition depend upon various factors such as country, topography of the area, different seasons, food habits, commercial status and activities of the city [7, 5, 8] and standard of living. The relative percentage of organic waste in MSW is generally increasing with the decreasing socio - economic status; evident from rural households as well as low and mid - income urban households generate more organic waste than urban households.

Composition of municipal solid waste

In this study, 15 different fractions of waste have been segregated in the collected sample, i.e., 6 under organic and 9 under inorganic. The maximum waste composition was found to be inorganic as in figure 2, with 63.87% in Monsoon, 65.17% in Post Monsoon, 50.30% in Winter and 57.77% in Pre Monsoon. While rest includes organic waste. As per previous studies, organic waste showed a maximum while comparing with inorganic waste. According to the study carried out by [9], the results revealed that organic contents were 12.52% in the first season and 15.14% in the second season. Inorganic wastes were 8.31% in the first season and 6.55% in the second season on an average weekly disposal of five samples in two different seasons. From the results, it can be concluded that the organic waste can be converted into organic manure by composting method. For the inorganic contents, it can be concluded that after recovery and reuse they can be used instead of disposing into the environment.

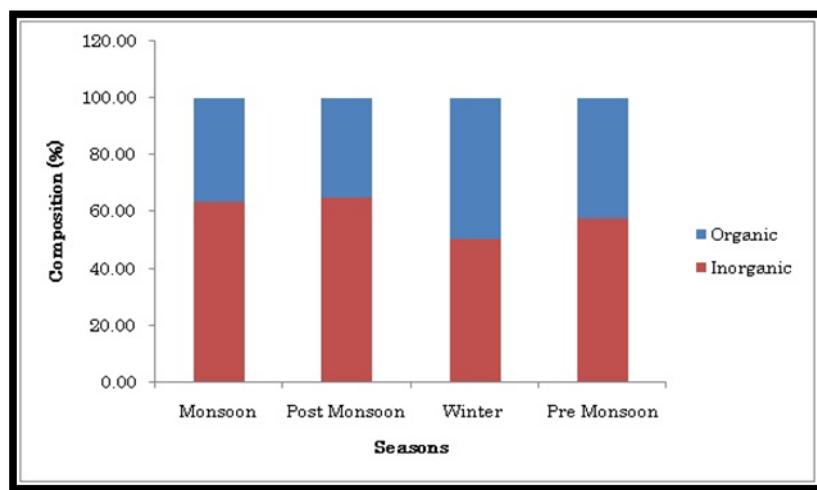


Figure 2: Ratio of Composition in Municipal Solid Waste during Different Seasons

Organic Waste

Organic wastes are waste originated from the living organisms. It mostly contains food waste, fruit and vegetable waste and garden clippings. As they are rich in organic content, the best disposal method suggested for organic waste is composting technique. But now a days organic waste has been disposed along with the inorganic waste in landfill. Out of 4 seasons, the winter showed the maximum quantity of organic waste (49.70%) and minimum quantity in the post monsoon (34.83%). The materials found in the organic waste are mostly paper and cardboard, textile like cotton, jute and silk, garden trimmings and yard waste, vegetables, fruits and food waste, slaughter waste and wood. Figure 3 shows the quantity of different organic waste collected during different seasons. In all four seasons, the major contribution of organic waste is vegetables, fruits and food waste (30 – 40%) procured from both residential areas and hotels. The least contributed source is the slaughter waste ranging between 3 – 6%. Other sources show the mixed contribution during different seasons.

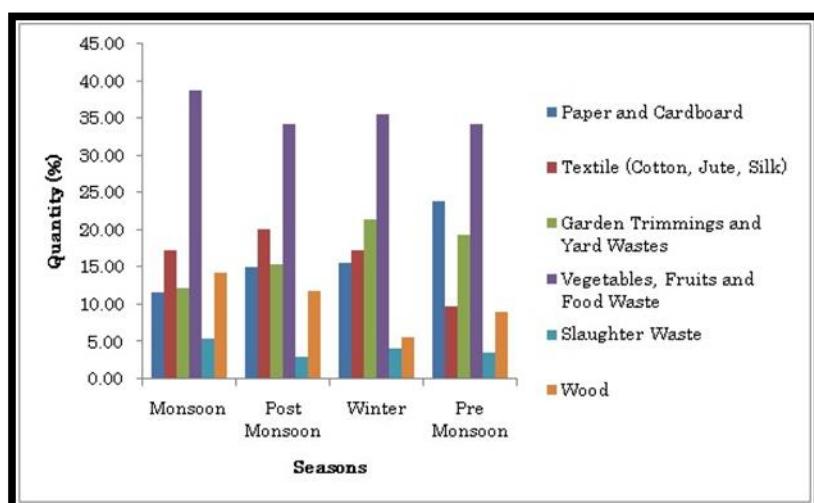


Figure 3: Quantity of Different Organic Waste Present in Municipal Solid Waste in Different Seasons

Previous studies showed the results it was clearly observed that the major portion of the waste from all the categories like commercial and residential was biodegradable waste for all the months in Dharapuram municipality. The relative percentage of organic waste is generally increasing with the decreasing socioeconomic status; so rural households generate more organic waste than urban households [10]. Another researcher [11] reported that the MSW composition from Perungudi dumping site (Chennai City, Tamil Nadu) contained about 60–70 % combustible materials such as textile, leaves, plastics, food waste, etc., with an average of 65 %. Degradation is a natural process & undergoes decomposition itself. Biodegradable wastes can undergo decomposition naturally, without any treatment or disposal methods. The product obtained after decomposition process is used as manure in crop & agricultural fields to obtain more yield & available to farmers at cheaper cost. [12] in their study in Jabalpur had shown that the 47% of urban solid waste were degradable and 53% non-degradable, they tried to recycle the waste. The results of their study clearly indicate that the recycling of solid urban waste can transform garbage or municipal solid waste to enriched composts. As most of the urban waste contains high amount of organic carbon due to presence of cow dung and green manure (high C: N ratio), it can be used in urban waste composting. This is practical significance if adopted by urban farmers as a result of soil health and in turn the productivity of soil can be maintained for further agriculture [13].

Inorganic Waste

Inorganic waste consists of construction wastes like stones, tiles and bricks, glass, metals (both ferrous and non ferrous) leather, plastics such as bags and containers, rubber and tires, e-waste and biomedical waste. These cannot be decomposed by a natural process, but can be disposed by treatment or disposal methods. By depositing these materials large amounts of pollutants are released into the environment, thereby polluting it [14]. Inorganic wastes are classified based on its hazardous characteristics. In this study, inorganic waste contribution was found extreme during all four seasons (Figure 4). The major contribution of inorganic waste is plastics in the form of bags and containers (44.73% in monsoon, 47.26% in post monsoon, 47.91% in winter and 58.97% in pre monsoon) followed by construction waste including stones, tiles and bricks (15.24% in monsoon, 10.49% in post monsoon, 10.07% in winter and 14.66% in pre monsoon). A minor contribution is from metal scraps in the form of ferrous (1.62% in monsoon, 1.07 in post monsoon, 2.58% in winter and 0.63% in pre monsoon) and non ferrous (0.52% in monsoon, 0.36% in post monsoon, 0.86% in winter and 0.23% in pre monsoon). Inference of minimal percentage of both biomedical waste from hospitals, clinics and houses (2.19% in monsoon, 7.26% in post monsoon, 5.63% in winter and 3.98% in pre monsoon) and E – waste (6.63% in monsoon, 2.97% in post monsoon, 4.31% in winter and 1.38% in pre monsoon) turn the inorganic waste into the hazardous waste resulting in environmental pollution.

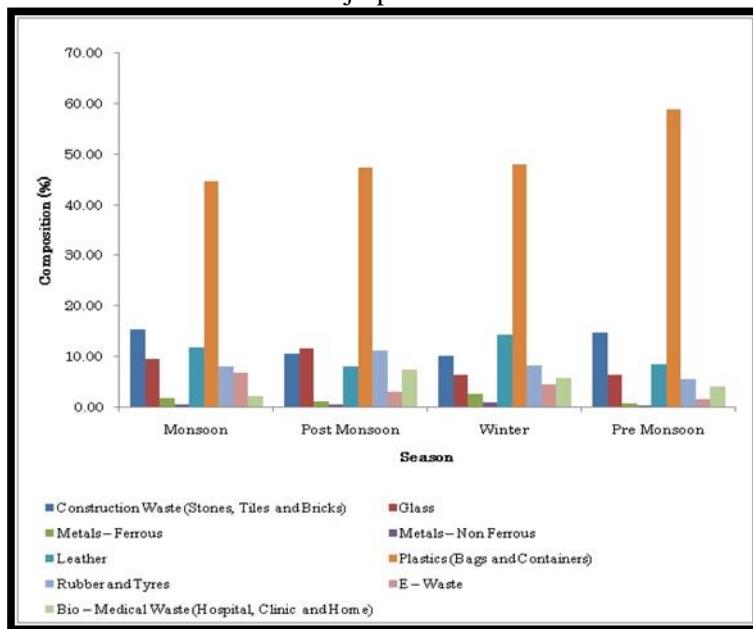


Figure 4: Quantity of Different Organic Waste Present in Municipal Solid Waste in Different Seasons

As per the research work carried out by [15], the inert matter is produced in huge quantity. It is because of high pace of construction and demolition activities in Delhi. The other major component of the MSW like paper, plastic, metal, glass and crockery and non biodegradable waste (leather, rubber, bones and synthetic material) in the MSW stream have increased. The study carried out by [16] showed that in the inorganic portion of municipal solid waste plastics play a major role in both summer and winter season. It was observed in the study that plastic containers of soft drinks, cheese, juices and beverages which are frequently consumed, essential foods come in plastic containers itself contribute to the larger composition in the waste stream. Plastic containers tend to occupy more space in the landfill due to its rigidity against compaction in the landfill. It follows the paper waste, which is made up of paper packages (cardboard and combined packages) and prints (newspapers, magazines and books). Improper disposal of municipal solid wastes causes huge social costs in terms of spreading communicable diseases, increased transition costs of pollution and is an issue of increasing concern, especially in the developing cities [17]. Much of the society's solid waste is disposed in sanitary landfills, where it undergoes physical, chemical and biological transformations. Sanitary landfills are widely used for the disposal of municipal solid waste (MSW) due to their economical and convenient advantages. However, leachate and gas generated from landfills may pollute the environment if not properly managed [18]. More than 90% of wastes in India are believed to be dumped in an unsatisfactory manner. It is estimated that approximately 1400 km² was occupied by waste dumps in 1997 and this is expected to increase in the future [19]. Properly engineered waste disposal protects public health and preserves key environmental resources such as ground water, surface water, soil fertility and

air quality. Indian cities with containment, landfill sites include Mumbai, Kolkata, Chennai, Nasik, Vadodara, Jamshedpur, Allahabad, Amritsar, Rajkot, Shimla, Thiruvananthapuram and Dehradun [20]. The UN Environmental Programme defines landfill as the controlled disposal of MSW on land in such a way that contact between waste and the environment is significantly reduced, with a waste disposal concentrated in a well-defined area. Engineered landfill allows the safe disposal of residual MSW on land, but protects ground and surface water from pollution and avoids air emissions, windblown litter, odour, fire hazards, problems with animals, birds and other pests/rodents, and reduces greenhouse gas (GHG) emissions and slope instability issues [21]. Properly managed, engineered landfills should replace the dumps in India. This would significantly reduce the environmental impact of waste [22]. The most widely used waste-to-energy technology for inorganic waste uses combustion to provide combined heat and power [23]. Adopting maximum recycling with waste-to-energy in an integrated waste management system would significantly reduce dumping in India. Waste-to-energy technologies are available that can process unsegregated low-calorific value waste, and the industry is keen to exploit these technologies in India. Several waste-to-energy projects using the combustion of un-segregated low-calorific value waste are currently being developed. Alternative thermal treatment processes of combustion include gasification, pyrolysis, production of refuse derived fuel and gas-plasma technology.

4. CONCLUSION

Municipal solid waste (MSW) is a waste type that includes predominantly residential sometimes the addition of commercial wastes, construction and demolition debris, sanitation residue, and waste from streets collected by a municipality within a given area. Based on their characteristics, they are classified into organic and inorganic wastes. The characteristics of MSW collected from any area depend on a number of factors such as food habits, cultural traditions of the inhabitants, lifestyles, climate, etc. Due to the result of rapid population growth in the city, the composition of municipal solid waste showed a maximum of inorganic waste in all four season than organic waste. The maximum contribution of plastic waste reflects the ample use of plastic bags and containers on a daily basis. From other studies, it is clear that the inorganic waste, especially the role of plastic in current lifestyle has been projected to a higher extent. These plastics are dumped in landfill causing the environment to pollute. In certain instances hazardous waste like E – waste and Bio – medical waste are bonded together with inorganic wastes causing a severe threat to the surrounding environment. But whereas the organic portion of the waste is transformed into a useful resource by composting technique. So the best disposal technique to minimize the inorganic waste is to undergo energy production through incineration and pyrolysis or by means of sanitary landfills.

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6. CONFLICT OF INTEREST

None

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