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Physico-Chemical Characteristics of Municipal solid waste Management

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Abstract: Waste management is the most pressing environmental problem for cities and municipalities indeveloping nations. As a result of the varied climate, terrain, and geography of mountainous areas,relatively few research have been conducted and there is little data available. This research was carriedout in the western Himalayan region of Kashmir in the cities of Baramulla, Kupwara, and Bandipora.Underdeveloped waste management and unscientific trash disposal near rivers, streams, and lakesraises the risk of ground and surface water pollution. An array of crops' development and yields maybenefit from composted municipal solid waste (MSW) being incorporated into the soil, and the land'secological and economic functions can be restored. When it comes to food crops, MSW has showedpotential as a fertiliser for many different types of crops. Plant systems have responded in a variety ofways, with yields increasing anywhere from 0 to over 200.

Keywords: Municipal solid waste (MSW), Environmental, Composted, Management

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INTRODUCTION

The most obvious environmental issue facing cities today is waste. Population growth, changing consumption habits, economic development and increasing incomes all lead to a rise in the amount of solid trash created and a widening of the sorts of garbage that is generated as well. After pollution of the air and water, solid waste is often referred to as the "third pollutant." Material that has been wasted from household, commercial, and industrial activity is known as "solid waste." As a result of improper waste disposal, there are numerous negative consequences. These include polluting surface and groundwater through leachate, contaminating soil through direct contact or leachate, causing air pollution through waste burning, transmitting disease through various vectors, such as birds, insects and rodents, and releasing methane into the atmosphere through anaerobic decomposition of organic waste. However, environmental protection regulations have only been enforced in the national capitals of select nations. Solid waste disposal in rural regions continues to rely heavily on open dumping.

LITERATURE REVIEW

Masresha Mamo et.al (2021) Compost quality from municipal solid waste (MSW) and organic additions of coffee by-products and the leaf of Millettiaferruginea was assessed in this research. In this experiment, we used a variety of organic addition treatments and fresh compost materials (n = 30). (T1, T2, T3, T4, and T5).

Tests on the phytotoxicity of compost treatments were carried out using lettuce seeds (Lactuca Sativa L. var. crispa). Compost quality characteristics were analysed using SPSS (version 22) utilising ANOVA.

Compost T4 and T5 had similar physico-chemical characteristics, but they differ significantly from T3, T2, and T1 compost treatments in terms of temperature (26.4 °C), moisture content (45.5 percent), electrical conductivity (4.6 mS/cm), pH (7.9), and total nitrogen (1.2 percent) and phosphorous content (2918 ppm). T4 (101 percent) and T5 (102 percent) were shown to be phytonutrients for lettuce plants in a phytotoxicity test utilising treatment medium that were 100 percent compost. As a result, T3, T2, and T1 compost treatments are safe for lettuce plants, but T3 and T2 compost treatments are moderately harmful to lettuce plants. MSW + M. ferruginea compost (T4) and MSW + coffee pulp + M. ferruginea compost (T5) are helpful for increasing the physicochemical qualities of compost and are phytonutrients for lettuce plants. A large-scale recycling programme must be implemented in order to successfully manage the 75% organic percentage of garbage produced by houses in the research region, such as composting with organic additions.

Nicholas O.Anaekwe et.al (2020) It was determined that determining the energy generating capacity of municipal solid wastes may be a viable way to deal with trash. In accordance with ASTM standards, the percentage composition, close analysis, and energy content of municipal solid

waste (MSW) were all determined. Food waste (62.00 percent) had the largest percentage of MSW composition, whereas plastic (3.5 percent) had the lowest. There was a wide range of analytical findings for the MSW, with volatile matter (between 15 and 29 percent), fixed carbon (between 56 and 70 percent), moisture (between 3 and 72 percent), MC (between 4 and 11 percent), and ash (between 4 and 11 percent) being the closest in proximity (2.85-4.85 percent). Bento's model was used to estimate the MSW's energy content, based on the findings of proximate analysis. There was a 20.87 mJ/kg calorific value for MSW. This indicates that for every kilogramme of MSW that is dumped in Aba, roughly 21 mJ/kg of energy may be generated. MSW's power generating capacity was predicted to be 31MW, too. MSW from Aba Metropolis generated more energy than other biomasses (17 mJ/kg) and less than coal (37-40 mJ/kg), according to the findings of the research. Aba metropolitan and the rest of the nation might benefit from introducing waste- to-energy as an energy-efficient and environmentally- friendly approach of handling municipal solid waste.

YONG LU ET.AL (2020) As a result of MSWI's advantages in decreasing trash and generating energy, it has become an increasingly popular option. Human and environmental health are being negatively affected by the growing growth of MSWI fly and bottom ash. Pretreatment, leaching properties, physical and chemical properties as well as applications of fly and bottom ash were all addressed here. MSWI fly ash and bottom ash have mechanical qualities that are equivalent to natural aggregate, according to a review of the prior research on the subject. Materials used in highway construction and cement concrete aggregates have all undergone a great deal of development. The use of fly ash in highway engineering is restricted because of worries about the leaching of heavy metals. Bottom ash is seldom used in asphalt pavement because of its detrimental influence on the asphalt mixture's performance. The use of cement-stabilized macadam foundation offers a wide range of applications because of the cement's ability to solidify heavy metals and the inexpensive cost of fly ash and bottom ash. This reduces building costs and promotes trash incineration, particularly in underdeveloped nations, who benefit from this.

M.Z. Haile et.al (2019) Information on the physical and chemical properties of home municipal solid waste is needed to design and develop integrated waste management systems (MSW). A structured questionnaire and field observations will be used to gather information on the socioeconomic status and existing MSW management methods of Sawla people in Ethiopia. According to the statistics, there is no sanitary landfill in the town. To put this into perspective, the average amount of SW generated daily per person in the United States ranges from 0.21 to 1.02 kg. Chemically, the HHMSW was constituted mostly of food and organic waste (34.81 percent) and ash-dust (24.91 percent) (49.45 percent). 6.08 percent plastic,3.87 percent glass, 3.51 percent paper and 2.28 percent metal trash are still left over from the previous year. The MSW had a mean moisture content of 25.57 percent, volatile matter content of 28.09 percent, ash content of 32.03 percent, and fixed carbon content of14.32 percent. According to these results: 613.22 kg/m3, 10.657 pH, and 965°C ash fusing point for MSW.

TITILADUNAYO ET.AL (2018) In the city of Ilorin, Nigeria, an examination of municipal solid waste production and the physicochemical features of flammable fractions was conducted. In order to satisfy energy demands and avoid waste consequences, this was prompted by a desire for green and clean practises. Waste management in Ilorin necessitates in- depth knowledge of the physicochemical properties of the various waste parts. At the Lasoju dump-site, a 240-liter bin of garbage was tested 62 times over the course of eight months. Efforts were made to determine the combustible wastes' suitability for use as solid fuel. Recovery and waste component characteristics may be gleaned by manual sorting. Laboratory testing was conducted on nine of the nineteen components that were described. It was determined that 70% of the MSW generated is flammable, based on the physical characteristics.

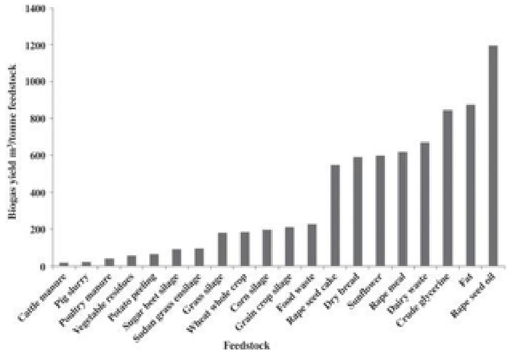
According to the preliminary examination, the wastes comprise more than 64% fixed carbon, 33% volatile matter, and 5% moisture, while the final analysis indicates that the MSW has more than 29% carbon that contributes to its calorific value. The average quantity of nitrogen and sulphur present is roughly 2.8 percent and 0.2 percent, respectively, which will reduce emissions during burning. Using a bomb calorimeter, the energy content of MSW was estimated to be about 20 MJ/kg. Ilorin metropolis' MSW stream may be used as a dependable and sustainable renewable energy source if it is burned.

Rishi Rana et.al (2017) Urban areas in India produce enormous amounts of solid garbage, and an integrated solid waste management system is an efficient way to deal with this problem. For a more efficient management system, the volume and kind of waste produced by various sources are key factors in the overall performance of the integrated solid waste management system. Characterization studies on urban solid trash are often carried out in this context to allow appropriate decision-making for the management of solid waste created. The characterisation of urban solid waste created in the Indian Tricity area of Chandigarh, Mohali, and Panchkula is presented in this study for the very first time. An investigation of the physical and chemical qualities of MSW produced in the three research areas for various socio-economic groups is being conducted in the current study. Accordingly, in the context of the characterization study, this paper proposes suitable alternatives to the current MSW management practises such as composting, vermicomposting as well as the setting up of a formal recycling unit and the installation of a bio- methanation plant along with the existing refuse- derived fuel (RDF) plant.

BIOGAS PRODUCTION FROM WASTE: TECHNICAL OVERVIEW, PROGRESS, AND CHALLENGES

Organic fraction of municipal solid waste

Most of MSW is made up of yard trash, corrugated printed newspaper, fruit and vegetable peels and leafs debris, food waste and leaves litter, among which food waste makes for the bulk of MSW's organic part. If adequate waste segregation is followed, AD is a viable solution for the treatment of MSW. Biogas generation from MSW is complicated by the fact that many individuals aren't aware that the organic and inorganic components of MSW must be separated. Second, biogas production is influenced by composition fluctuation. Seasons, lifestyles, and eating habits may be to blame for this change in composition.

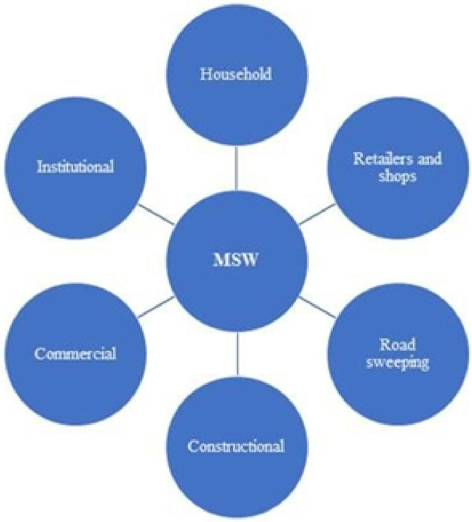


TYPES, SOURCES AND MANAGEMENT OF URBAN WASTES

Sources of MSW generation

Industries, schools, and homes all produce MSW (EPA, 2019). There are many different materials that may be found in MSW. These include food waste and other organic materials such as metals and textiles. Open dumping and land filling are the two most frequent ways for disposing of MSW. Environmental pollution, methane gas production that contributes to global warming, and labour concerns are all adverse consequences of both systems. MSW may create energy when molecular links between C–H–O are disrupted, due to the occurrence of such bonding.

It was estimated that each individual created around 0.74 kg of solid garbage each day in the urban population. Urbanization is predicted to lead to a 70 percent rise in yearly trash creation between 2016 and 2050. From 2016 to 2050, the amount of garbage generated is predicted to rise from 2.01 billion tonnes to 3.04 billion tonnes (World Bank, 2019). Every year, the world generates 1.9 billion metric tonnes of MSW, with each individual contributing 218 kilogrammes of that mass (WA, 2019)



CHARACTERIZATION OF THE SOLID WASTE

Samples from the mounds in that site were analysed after they were gathered. As well as biological research, we also performed an in-depth physiochemical examination. Magneto-inductive communication and the sample's heat retentiveness prompted the investigation of magnetic characteristics. The underground biochemical process and waste leaching both depend on thermal conductivity, which was determined. Studies on pH, salinity, and TDS had a major impact on the development of bacteria and the formation of algae in the runoff that washed the mounds.

Measurement of Inductance in Different Sample

Electromotive force (EMF) may be created by a change in the current passing through an inductor or a circuit. The magnetic permeability of a material affects the inductance.

Magnetic Permeability: Permeability in electromagnetism is a measure of a material's ability to facilitate the creation of a magnetic field inside itself. Thus, the degree of magnetization that a material acquires in response to a magnetic field is defined.

Magnetic Susceptibility: The degree to which a material is magnetised in response to an applied magnetic field is measured by its magnetic susceptibility, which is a dimensionless proportionality constant. The ratio of magnetic flux density to magnetic moment is known as magnetizability. Based on the fundamental premise, this approach is applied. Samples are then added to the empty sample holder to measure the magnetic induction. We can control the current and the magnetic fields using it as the core material. Below, you'll find a working formula and the final findings in Table 1.

Working Formula: Magnetic Permeability (μ) = L2l/N2a; Magnetic Susceptibility (χ) = μ-1; Where L= Self Inductance N= Number of turns

Table 1: Materials Different of Permeability Magnetic:

Sample	Inductance In mH.	Relative Magnetic Permeability (μ) ×10-7	Magnetic Susceptibility (χ)	Magnetic Property
I	10.47	0.92919	0.999999	Diamagnetic
II	10.45	0.92556	0.999999	Diamagnetic
III	10.46	0.92733	0.999999	Diamagnetic
IV	10.46	0.92733	0.999999	Diamagnetic

CONCLUSION

An indicator of soil quality may help determine the best course of action for cleaning up contaminated soil that has been exposed to the elements due to open dump sites. Soil quality in and around the Coimbatore area is generally within acceptable norms, with a few exceptions, according to these findings Therefore, efficient solid waste management practises should be followed to limit the negative influence on the soil, and in situ bioaccumulation studies should also be undertaken to prevent soil contamination caused by open dumping of solid waste. On the basis of the present study, we can infer that the ground water near MSW dumping places is most of the time far below the CPCB's permitted level, but there are certain regions where we can follow the safety recommendation of following the following guidelines. The research examined the change in water quality in Jabalpur's groundwater near MSW.

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