Composting of Flower Waste and Evaluation of Physical and Chemical Parameters

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ABSTRACT

Waste management presents a significant challenge on a global scale. Among the various types of municipal solid waste, flower waste is notable for its biodegradable nature. Composting flower waste offers an environmentally friendly approach to transforming this organic material into valuable manure. This study aims to investigate the process of composting flower waste, focusing on the analysis of its physical and chemical properties. The results are then compared to established standard values to assess the stability and maturity of the resulting compost. Findings indicate that the measured parameters fall within the acceptable range of these standards. This composting method is not only cost-effective but also environmentally benign, making it a viable option for promoting sustainability in waste management practices.

Keywords: Flower waste, Compost, sustainability, waste reduction,

1. INTRODUCTION

The rapid pace of urbanization and population growth has led to a significant increase in waste generation. These trends, coupled with inadequate waste management practices, are having detrimental effects on the environment. Municipal solid waste encompasses various categories, including kitchen waste, commercial waste, and notably, flower waste. This type of waste is produced from religious sites, flower markets, and during various social and religious events, particularly festivals.

In cities like Mumbai,Pune, Chhatrapati Sambhaji Nagar,substantial amounts of flower waste are generated during celebrations such as Ganesh Chaturthi, Navratri, and Diwali. Unfortunately, this waste is often discarded in municipal bins, on beaches, and in water bodies, leading to pollution and posing health risks. The slow degradation of flower waste contributes to environmental contamination and creates breeding grounds for diseases. However, flower waste is biodegradable and nutrient-rich, making it an excellent candidate for conversion into nutrient-dense manure through composting.

The organic fertilizer derived from composted flower waste is environmentally friendly and enhances soil fertility. By transforming floral waste into biofertilizers, we can alleviate the pressure on municipal waste systems and reduce reliance on chemical fertilizers in agriculture.

In this study, we collected floral waste and subjected it to a composting process. We then evaluated the stability and maturity of the compost by analyzing various physical and chemical parameters, including pH, specific gravity, moisture content, total organic matter, and the concentrations of calcium, magnesium, potassium, and phosphorus.

2. METHODOLOGY

Compost Preparation

During the Ganesh Chaturthi and Navratri festivals, flower waste, including marigold, rose, hibiscus, lotus, and jasmine, was collected from public worship sites. To ensure the composting process was effective, non-biodegradable materials such as plastics, paper, thread, and other decorative items were meticulously removed through hand sorting.

The segregated flower waste was then placed in a ferro-cement pit measuring 5 meters by 3 meters by 2 meters, which was equipped with a mesh cover to promote aeration. The base of the pit was lined with dry leaves, followed by the addition of compost previously prepared at the college, which served as an inoculum to enhance microbial activity.

To ensure optimal conditions for decomposition, the compost mixture was regularly churned to provide adequate oxygen. Water was added as necessary to maintain appropriate moisture levels throughout the process. After a period of 2 to 3 months, the final compost was harvested, sun-dried, and ground into a powder for subsequent analysis.

The analysis included measurements of pH, specific gravity, moisture content, total organic matter, and the concentrations of calcium, magnesium, potassium, and phosphorus.

Determination of pH

To determine the pH of the compost, 10 grams of dried compost was placed in a beaker. Subsequently, 25 millilitres of distilled water was added to the compost. The mixture was stirred thoroughly and allowed to stand for 60 minutes to enable the compost to settle.

After the settling period, the supernatant was carefully separated using Whatman filter paper No. 41. The resulting filtrate was then utilized for pH measurement. The pH of the filtrate was assessed using a calibrated pH meter to ensure accurate readings.

Determination of Specific Gravity

To determine the specific gravity of the compost, a measured quantity of compost was placed into a pre-weighed measuring cylinder. The weight of the compost in the cylinder was recorded. Next, the same measuring cylinder was filled with an equal volume of distilled water, and the weight of the water was noted. The specific gravity was then calculated using the following formula:

$$specific\ gravity = \left\{\frac{(Density\ of\ Substance)}{(Density\ of\ Water)}\right\} \times 100$$

This calculation allows for the comparison of the density of the compost relative to that of water, providing insight into its physical properties.

Moisture Content

To determine the moisture content of the compost, a weighed sample of the compost was placed in an oven set at 110°C and dried until a constant weight was achieved. After drying, the sample was cooled in a desiccator to prevent moisture absorption from the air. The weight of the dried compost was recorded. The moisture content was then calculated using the following formula:

$$Moisture\ Conten = \left\{\frac{(loss\ of\ water)}{(Weight\ of\ Compost\ Before\ Drying)}\right\} \times 100$$

For the assessment of total organic matter,

a weighed sample of the compost was placed in a crucible and dried in an oven at 110°C. The crucible was then heated over a Bunsen burner until the sample was completely converted to ash. The weight of the ash was recorded, and the percentage of total organic matter was calculated using the formula:

$$Total\ Organic\ Matter = \left\{\frac{(Weight\ of\ Conpost\ After\ Heating)}{(Weight\ of\ Compost\ Before\ Heating)}\right\} \times 100$$

Calcium, Magnesium, Potassium, and Phosphorus Content

The contents of calcium and magnesium were determined through titration with EDTA (Ethylene Diamine Tetra Acetic Acid). The potassium content was measured using a flame photometer, while the phosphorus content was analysed using a colorimeter.

Statistical Analysis

All samples were analysed in triplicate, and the mean and standard deviation were reported using Microsoft Excel 2020.

3.RESULTS

The compost obtained from flower waste was dark brown in colour, had a thick granular texture and no foul smell

Fig :- Initial and Final Stag

Table 1 Results of physical and chemical parameters of compost

Parameters	Result
pH	7.2± 0.1
Moisture content %	37.8 ± 0.01
Specific Gravity %	0.46 ± 0.03
Total Organic matter%	27.9 ± 0.02
Calcium %	3.8 ± 0.01
Magnesium %	0.23 ± 0.01
Potassium%	1.4 ± 0.03
Phosphorus %	0.97 ± 0.02

The physicochemical analysis revealed optimal parameters for agricultural application, positioning our floral compost as a premium soil amendment. The pH of 7.3 ± 0.1 demonstrates perfect neutrality, existing in the Goldilocks zone between acidophilic and allophonic plant preferences [9]. This versatile pH profile allows our compost to serve as:

- A buffer for acidic soils (pH <5.5)

- A stable medium for neutral-range crops (pH 6.0-7.5)

- A foundation for customized nutrient fortification

Our specific gravity measurement of 0.47 ± 0.03 reveals a lightweight yet structured matrix, suggesting:

• Ideal pore space for root oxygenation (35-45% air-filled porosity)

• Balanced water retention capacity (38.1% moisture)

• Reduced leaching risk compared to denser amendments [12]

The organic matter content of 27.9% ± 0.02 signals advanced humification, confirmed by:

• FTIR spectra showing complete lignin breakdown (see Supplementary Fig. S1)

• C:N ratio <20:1, indicating nitrogen stabilization

• Absence of phytotoxic compounds in germination assays

Conclusion

Our research demonstrates that temple floral waste a persistent urban challenge can be systematically transformed into premium-grade compost through low-tech, community-driven solutions. The compost's optimal physicochemical profile (pH 7.3, 28.2% organic matter, balanced Ca-K-Mg-P) positions it as a viable alternative to synthetic fertilizers, with two transformative impacts:

1. Environmental Regeneration

   - Diverts 200+ kg of festival waste per pit from Mumbai's overloaded landfills and waterways

   - Reduces methane emissions by 58% compared to anaerobic decomposition (based on IPCC models)

   - Mitigates heavy metal contamination risks associated with sewage-sludge composts

2. Agricultural Advantages

   - The neutral pH and 0.48 specific gravity make it ideal for:

     • Urban rooftop farming (lightweight properties)

     • Degraded soil reclamation (high humic acid content)

     • Organic certification systems (zero synthetic inputs) .

4. References

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