



MANAGEMENT OF FLORAL WASTE BY COMPOSTING

¹Meetali Das Gupta, ²Shrutika Kumthekar,

¹Associate Professor, ²Assistant Professor,

¹Department of Chemistry,

¹Guru Nanak College of Arts, Science & Commerce, G.T.B.Nagar, Mumbai-400037, India

Abstract: Waste management has become a major issue in cities due to tremendous increase in the quantity of waste generated every day. Municipal solid waste includes flower waste which has high moisture content and is biodegradable. Improper disposal of flower waste cause environmental pollution. Composting of flower waste is an environment friendly way of converting the flower waste into biofertilizer. The present study focuses on composting flower waste and checking the stability and maturity of the compost by analysing the physical and chemical parameters. The results of these parameters were found to be within the acceptable limits of standard values. The mature compost can be used for enriching the soil and can support the growth of plants. This method is affordable, pollution free and can be promoted for better waste management.

Index terms- flower waste, composting, waste management

I. INTRODUCTION

The amount of solid waste generated every day is increasing due to increasing population and inefficient waste management systems. Municipal solid waste consists of 70 % organic waste mostly comprising of kitchen waste, vegetables and flower waste (Dayanand Sharma et al, 2018). Floral waste generated from places of worship, social functions, flower markets are usually discarded in municipal bins, open lands and rivers. They decay naturally leading to water, air pollution and affect marine and human life. In Mumbai city tons of flower wastes are generated during the Ganesh Chaturthi, Navratri and Diwali festivals. These are discarded in municipal bins, beaches, water bodies, landfills and open space. These flower waste degrade slowly and is a source of water and environment pollution and a breeding ground for diseases. These flower wastes are biodegradable, rich in macro and micronutrients and can be easily converted to organic manure by composting process. The organic fertilizer obtained from composted flower waste is eco-friendly and can be used to enrich soil (Dayanand Sharma et al, 2017). Thus, floral waste can be converted to biofertilizer which will not only decrease the burden of municipal waste but will also reduce the need for chemical fertilizers (M.Fantina et al, 2021)

In the present study, flower waste was collected, composted and the stability and maturity of the compost was checked by analysing different physical and chemical parameters like bulk density, electrical conductivity, porosity, water holding capacity, organic carbon content, nitrogen content and C/N ratio.

II. MATERIALS AND METHODS

Preparation of Compost:

Marigold, rose, hibiscus, lotus, jasmine and other flowers generated in public worship places during Ganesh Chaturthi, Navratri and Diwali festivals were collected and the non-biodegradable parts like plastics, paper, thread and other decorative materials were removed by hand sorting. The segregated flower waste was transferred to ferro-cement pit of the size 5*3*2 with a mesh on the top for circulation of air. The base of the pit was layered with dry leaves and above this layer, compost prepared in the college was added as an inoculum (Meetal Das Gupta et al, 2023). It was stirred up regularly so that it receives sufficient amount of oxygen. Water was sprinkled as and when required to maintain the level of moisture. The final compost was ready in 2-3 months, was sun dried and powdered for analysis. The bulk density, electrical conductivity, porosity, water holding capacity, organic carbon content, nitrogen content and C/N ratio was measured (Nisha Jain, 2016, Yogini Mulay et al, 2020, El-Sayed G. Khater et al, 2015)

Determination of bulk density

Compost was dried at 110°C for 1 and half hours until constant weight was obtained. Weighed compost was transferred in a measuring cylinder and the level occupied by the compost was noted. The bulk density was calculated from the equation:

$$\text{Bulk Density} = \frac{\text{Weight of compost (gm)}}{\text{Volume of compost (cm}^3\text{)}}$$

Determination of electrical conductivity

10 gm dried compost was mixed with 25 ml of distilled water. The solution was stirred and allowed to stand for 60 minutes till the compost settled down. The supernatant was separated using Whatman filter paper No. 41 and the electrical conductivity of the filtrate was measured on a conductometer.

Determination of porosity

The compost was transferred to a measuring cylinder and the volume was noted as sample volume. A known volume of water was taken in another measuring cylinder. The compost was saturated with water till it is close to the surface level. The volume of the water used is equal to the pore volume. The porosity was calculated from the equation:

$$\% \text{ Porosity} = \frac{\text{Pore volume}}{\text{Sample volume} + \text{Pore volume}} \times 100$$

Determination of water holding capacity

25g of compost was taken in a funnel layered with filter paper. The funnel was placed on a measuring cylinder. 50ml water was poured on it. The filtrate was collected and the volume was measured in a measuring cylinder. The water holding capacity was calculated from the equation:

$$\% \text{ Water holding capacity} = \frac{\text{Volume of water retained}}{\text{Weight of sample}} \times 100$$

Determination of organic carbon content

The organic carbon content present in the compost was estimated by Walkley - Black method.

Determination of total nitrogen content

Total nitrogen was estimated by Kjeldahl method

Determination of C/N ratio

It is the ratio of total carbon content to the total nitrogen content

III. STATISTICAL ANALYSIS

The different samples were analyzed in triplicates and the mean standard deviation was reported by using Microsoft Excel 2020.

IV. RESULTS

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



Initial stage of Flower waste

Final stage of Flower waste

Figure 1

The results of bulk density, electrical conductivity, porosity, water holding capacity, organic carbon content, nitrogen content and C/N ratio are given in table 1.

Table 1 Results of physical and chemical parameters of compost

Parameters	Result
Bulk density (g/cm^3)	0.85 ± 0.02
Electrical conductivity (mmho/cm)	5.45 ± 0.04
Porosity %	49.2 ± 0.4
Water holding capacity %	56 ± 1
Organic carbon content %	15.6 ± 0.1
Nitrogen content %	0.92 ± 0.02
C/N ratio	18.1 ± 0.3

The mechanical properties of compost such as porosity and compaction is influenced by bulk density (K.Azim et al.). Higher values of bulk density indicate an increase in mass and decrease in porosity and air volume (Nappi P. and Barberis R.,1993). The value of bulk density of our compost sample was found to be $0.85 \text{ g}/\text{cm}^3$ which agrees with the values reported by (Nisha Jain, 2016).

The electrical conductivity value was 5.45 mmho/ cm which is similar to the value reported by (Yogini Mulay et al, 2020, Dayanand Sharma et al, 2017). Electrical conductivity is related to total soluble salt content and it is generally in the range of 1 to 10 mmho/ cm. High salinity may be toxic to the plants (David W. Horne, 2019).

The porosity value was 49.2 % which is similar to the value reported by (Mayur Shirish Jain et al, 2019). Porosity depends on bulk density and moisture content of compost (El-Sayed G. Khater et al, 2015).

The water holding capacity is the amount of water retained in the spaces of soil and it is one of the important agronomic parameters. The value of water holding capacity of our compost sample was found to be 56 % which is in an acceptable range (K.N.Sujatha et al. 2016). Different types of soil retain different amounts of water, depending on the particle size and the amount of organic matter. When compost is mixed with the soil, there is an increase in amount of water retention. High organic matter increases the water holding capacity of soil (David W. Horne, 2019).

The microorganisms consume carbon during aerobic fermentation. Carbon is one of the important components and serve as a source of energy and elemental composition (K. Azim et al). The organic carbon content of the compost sample was 15.6 % which agrees with the results obtained by (Nisha Jain, 2016, El-Sayed G. Khater et al, 2015). Thus the compost sample prove to be a good organic fertilizer.

Nitrogen is essential for the synthesis of amino acids, nucleic acids and as building blocks of proteins. (K. Azim et al.). The nitrogen content was found to be 0.92 % which is in agreement with the values reported by (El-Sayed G. Khater et al, 2015, David W. Horne, 2019). As nitrogen is necessary for cell growth and function of the plants and is considered to be one of the important macronutrients, this compost sample will be an enriching biofertilizer.

Kumar et al, 2010 stated that the carbon to nitrogen ratio affects the composting process and quality of compost product. It is an indicator of compost stability and availability of nitrogen. Compost with C/N ratio > 30 will immobilize N if applied to soil, while those with C/N ration < 20 will break-down organic N to inorganic N (David W. Horne, 2019, Dayanand Sharma et al, 2017). The calculated C/N ratio of the compost sample was found to be 18.1, which once again prove that the compost sample generated from flower waste will act as a good soil conditioner.

V. CONCLUSION

In this study, the results revealed that flower waste can be easily converted to stable and matured compost. The values of bulk density, electrical conductivity, porosity, water holding capacity, organic carbon content, nitrogen content and C/N ratio were within the recommended range. Thus the compost was found to be an enriching organic manure. The compost generated in the college from floral waste is of good quality and can be used as a very good biofertilizer. This method can be adopted locally to reduce the overall waste being sent to landfill and convert waste to resources. The increase in water pollution due to dumping of flower waste can be controlled by using this technique. This technique can be adopted by places of worship and flower markets as a solid waste management strategy.

It can be concluded that flower waste composting can be successfully carried out by using the compost prepared from wet waste as an inoculum.

Finally, it can be concluded that in cities like Mumbai this method can be applied during the festival season to convert the floral waste to organic manure since it is the most cost-effective and environment friendly method. This method can be promoted as one of the sustainable waste management techniques.

VI. ACKNOWLEDGMENT

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