

Composting of flower waste and evaluation of physical and chemical parameters

¹Meetali Das Gupta, ²Shrutika Kumthekar

¹Associate Professor, ²Assistant Professor,
Department of Chemistry
Guru Nanak College of Arts, Science & Commerce
G.T.B.Nagar, Mumbai-400037, India

Abstract- Waste management has become a major challenge globally. Municipal solid waste includes flower waste which is biodegradable. Composting of flower waste is an eco-friendly way of converting the flower waste into organic manure. The present study focuses on converting flower waste to compost and analysing the physical and chemical parameters and comparing the values with standard values to check the stability and maturity of the compost. The results of these parameters were found to be within the range of standard values. This method is cost effective and pollution free and can be promoted to maintain environment sustainability.

Key Words: flower waste, composting, waste management.

INTRODUCTION

Nowadays, urbanization and increase in population has caused an increase in the quantity of waste generated. These factors along with inefficient waste management are affecting the environment. Municipal solid wastes include kitchen waste, commercial waste and flower wastes “[1, 2]”. Flower waste is generated from religious places, flower markets, religious functions, social functions and also during festivals. Floral waste obtained from religious places are thrown in landfills and water bodies which causes pollution and is a health hazard “[3, 4]”. In Mumbai large quantity of flower wastes are generated during the Ganesh Chaturthi, Navratri and Diwali festivals. These are discarded in municipal dustbins, beaches and water bodies. Since degradation of flower waste is a slow process, it is a source of water and environment pollution and a breeding ground for diseases. These flower wastes are biodegradable and are rich in nutrients and can be easily converted to nutrient rich manure by composting process. The organic fertilizer obtained from composted flower waste is eco-friendly and increases soil fertility. Thus, floral waste can be converted to biofertilizers which will decrease the burden of municipal waste. This will also reduce the use of chemical fertilizers in agriculture “[5]”. In the present study, floral waste was collected, composted and the compost stability and maturity were checked by assessing different physical and chemical parameters. The pH, specific gravity, moisture content, total organic matter, calcium, magnesium, potassium and phosphorus content were determined.

MATERIALS AND METHODS

Preparation of Compost:

The flower waste namely marigold, rose, hibiscus, lotus, jasmine generated in public worship places during Ganesh Chaturthi and Navratri 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 a ferro-cement pit of the size 5*3*2 with a mesh on the top to facilitate aeration. The base of the pit was layered with dry leaves and above this layer, compost prepared in the college was added as an inoculum “[6]”. It was churned regularly so that it receives sufficient amount of oxygen. Water was sprinkled as and when required to maintain the moisture level. The final compost was obtained in 2-3 months and was sun dried and powdered for analysis.

The pH, specific gravity, moisture content, total organic matter, calcium, magnesium, potassium and phosphorus content were measured “[7,8]”.

Determination of pH

10 gm dried compost was transferred to a beaker. 25 ml of distilled water was added to it. 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 filtrate was used for taking the readings. pH of the filtrate was measured using a calibrated pH meter.

Determination of Specific gravity

A weighed amount of compost was transferred to a pre-weighed measuring cylinder. The weight was noted down. The same measuring cylinder was filled with equal volume of distilled water. The values were substituted in the formula and the specific gravity was calculated.

Specific gravity = $\frac{\text{Density of substance}}{\text{Density of water}}$

Moisture Content

A weighed amount of compost was taken. The compost was dried in an oven at 110°C till constant reading was obtained. The compost was cooled in a desiccator. The compost was weighed and the reading was noted down. The values were substituted in the formula and the moisture content was determined.

$$\text{Moisture content} = \frac{\text{loss of water}}{\text{Weight of compost before drying}} \times 100$$

Total organic matter

A weighed amount of compost sample was taken in a crucible and dried in an oven at 110°C. The crucible was placed above a Bunsen burner and heated till the sample was converted to ash. The crucible ash was weighed. The percentage of total organic matter was calculated.

$$\text{Total Organic matter: } \frac{\text{Weight of compost after heating}}{\text{Weight of compost before heating}} \times 100$$

Calcium, Magnesium, Potassium and Phosphorus Content

Calcium and magnesium content were determined by titration with EDTA (Ethylene Diamine Tetra Acetic acid) Potassium content was determined using flame photometer and Phosphorus content was analyzed using colorimeter “[7, 8]”.

STATISTICAL ANALYSIS

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

RESULTS

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

Figure 1



Initial stage of Flower waste



Final stage of Flower waste

The results of pH, specific gravity, moisture content, total organic matter, calcium, magnesium, potassium and phosphorus content are given in table 1.

Table 1 Results of physical and chemical parameters of compost

Parameters	Result
pH	7.3 ± 0.1
Specific gravity	0.48 ± 0.03
Moisture content (%)	38.1 ± 0.01
Total organic matter (%)	28.2 ± 0.02
Calcium (%)	3.9 ± 0.01
Magnesium (%)	0.25 ± 0.01
Potassium (%)	1.5 ± 0.03
Phosphorus (%)	0.98 ± 0.02

The value of pH of the compost was found to be 7.3, which is in accordance with the ideal range 5.0 - 8.5 as suggested by “[9]”. The low pH is suitable for acid loving plants whereas, neutral pH is suitable for wide range of plants “[10]”. Thus, the compost is suitable for the growth of the plants. The value of specific gravity of the compost sample was found to be 0.48.

Moisture content of the compost was 38.1 %. Ideally moisture content must be in the range of 30-50%. If it is more, the compost will be clumpy and if it is less, the compost will be dusty “[8]”.

The total organic matter was found to be 28.2 % . These results are in agreement with the results obtained by “[11]” who stated that in a mature compost, the total organic matter must be below 30 % indicating that the breakdown of organic matter and humification index is high.

Calcium content was found to be 3.9 %, Magnesium content was 0.25 %, Potassium content was 1.5% and Phosphorus content was 0.98% which are in agreement with the values reported in “[7, 8, 12,13]”. All these macronutrients which are essential for plant growth are found to be in the standard range. An imbalance in these macronutrients can impact the plant growth.

CONCLUSION

This study focused on converting flower waste to compost and evaluating their physical and chemical properties. The results revealed that matured compost was obtained and the values of pH, specific gravity, moisture content, total organic matter, calcium, magnesium, potassium and phosphorus content were in agreement with the standard values.

The compost generated in the college from floral waste is of good quality and can be used as a very good soil conditioner and fertilizer. Students can be encouraged to carry out this composting process at the college level during the festival season which will reduce the load of floral waste in municipal bins. This method can also be followed by individuals at home which will reduce the overall waste being sent to landfills and reduce greenhouse emissions. The increase in water pollution due to dumping of flower waste can be reduced by using this technique.

Thus, it can be concluded that the degradation of the flower waste was effectively carried out by using the inoculum which was initially prepared in the college from wet waste “[6]”.

Finally, it can be concluded that in cities like Mumbai this method can be adapted during the festival season to recycle floral waste since it is the most economic and environment friendly way of dealing with flower and garden waste.

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