Available online at **www.joac.info**

ISSN: 2278-1862

Journal of Applicable Chemistry

2019, 8 (3): 1432-1438

(International Peer Reviewed Journal)

Studies on Prepared Vermicompost from *Rosa Berberia* (Rose Flower) Mixed with Cow Dung

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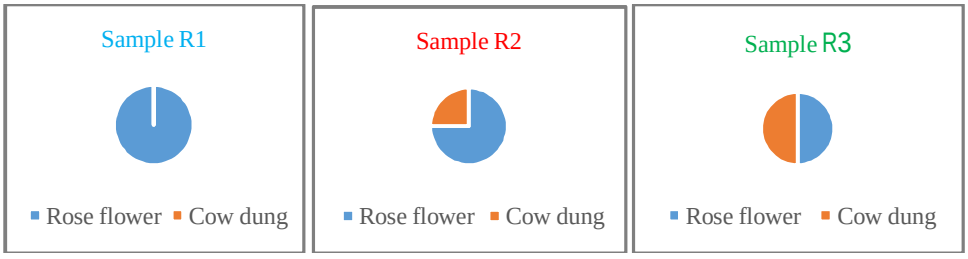
Accepted on 6th April, 2019

ABSTRACT

Vermicomposting is a method of making compost, with the use of earthworms which generally live in soil, eat biomass and excrete it in digested form. This compost is generally called vermicompost or Worm compost. The increasing quantity of solid waste is rapidly exhausting. The exhausting capacity of landfills and establishment of new sites are very difficult targets to achieve. Alternative practices to solid waste disposal can be reduction of solid waste at source of production, recycling, composting the organic waste and incineration. Patna the capital city of Bihar state has large number of temples, Mosques, Churches and Gurudwars. Devotees of different faith and religion profusely offer flowers, fruits, cotton, clothes etc. While performing prayers and rituals at their religious places. After the prayers or rituals are over these worship materials, mostly organic in nature are carelessly thrown away in nearby areas land or water bodies. According to one estimate organic waste worship materials constitute some 5-7 % of the total organic solid waste generated in the municipal area of Patna. Our present research work describes environment friendly disposal of organic components of the worship materials from some selected Temples, Mosques, Churches and Gurudwars of Patna through their vermicomposting using Eisenia fetida and Eudrilus eugenia species of earthworms. In this paper we study about the variation of micronutrients content in the process of vermicomposting. For this purpose, three composts are prepared R1, R2 and R3. R1 contains 100% rose flower, R2 contains 75% rose flower and 25% cow dung while R3 contains 50% rose flower and 50% cow dung. We analyze the macronutrients contents available in each compost and compare the findings.

Graphical Abstract



Percentage mixing of cow dung to rose flower.

Keywords: Organic floral waste, Vermicomposting, *Rosa Berberia* physiochemical analysis, *Eisenia Foetida* and *Eudrilus Eugenia* species of earthworms, Micronutrients.

INTRODUCTION

Patna, the state capital of Bihar has the pride to have many famous temples and worshipers who offer the rose flowers. In the modern age of development, the increasing quantity of solid waste is one of the growing problems in both developed and developing countries. The present research work aims to convert waste into wealth through conversion of huge amount of organic worship materials flowers, leaves, fruits etc. into valuable manure.

The dual objective of this Socio-Scientific Research work is to promote and popularize a scientific and eco-friendly method of disposal of huge piles of flowers, leaves, fruits etc. which can be commonly seen at almost all religious places- Temples, Mosques, Churches, Gurudwars etc. and to convert them into valuable manure. The popularization of the present Research work is sure to lessen the pressure on the government agencies and the organization. Here working on the safe disposal of huge quantum of municipal and agricultural waste products.

Environmental degradation is a major threat confronting the world, and the rampant use of chemical fertilizers contributes largely to the deterioration of the environment through depletion of fossil fuels, generation of carbon dioxide (CO_2) and contamination of water resources [**1**]. It leads to loss of soil fertility due to imbalanced use of fertilizers that has adversely impacted agricultural productivity and causes soil degradation [**2**].Conversion of these organic wastes into excellent nutrient rich disease resistant vermicompost [**3-5**].

Vermicomposting is a simple biotechnological process of composting, in which certain species of earthworms are used to enhance the process of waste conversion and produce a better product. Vermicomposting differs from composting in several ways [**6**].Vermicomposting is a technology that involves the bioconversion of organic waste into bio-fertilizers by the use of the earthworms [**10-13**]. This technology is increasingly becoming popular as a solid waste management strategy.

During the vermicomposting process, earthworms feed on the organic waste and their gut act as a bioreactor such that vermicasts are expelled [**14,15**]. These vermicasts are rich in the macro and micronutrients of a fertilizer [**16-18**].The macronutrients include nitrogen, phosphorous and potassium whereas the micronutrients include copper, iron, manganese and zinc[**24**]. In short, earthworms through a type of biological alchemy are capable of transforming garbage into “gold” [**7-9**].

The present study deals with the vermicomposting of *Rosa berberia* (Rose) flower collected from the Sai temple of Patliputra colony circle using *Eisenafoetida* and *Eugenia* species of earthworms. The study emphasizes that vermicomposting of temple waste is an excellent and eco-friendly method of temple waste management.The aim of this work is to find the nutrient contents of rose flower and their leaves after composting. The finished product as compost was analysed for macronutrients availability in them and their application as a viable organic manure by using them on growth of plants.

MATERIALS AND METHODS

The solid waste of rose was collected from the Sai temple at Patliputra Colony circle. The waste rose flower about 4kg was collected and filled in one of the pits of the vermicomposting unit established in the premises of A.N. College Patna. In the pit solid waste of rose flower was left for 12-15 days prior toexperimentation and watering was done on alternate days for pre composting, microbial degradation softening of waste and thermo stabilization. After 15 days 50 worms of similar age group of each species (*E.foetida* or *Eudriluseugeniae*) was inoculated in the experimental pit. This was done so as to avoid exposure of worms to high temperature during the initial thermopiles stage of composting. Vermicomposting samples were collected after 45, 60, 90 days [**25**]. The collected waste material was

left for few days and mix with cow dung. Waste rose (R1) contain 0% cow dung, waste rose (R2) contain 25% cow dung and waste rose (R3) contain 50% cow dung.

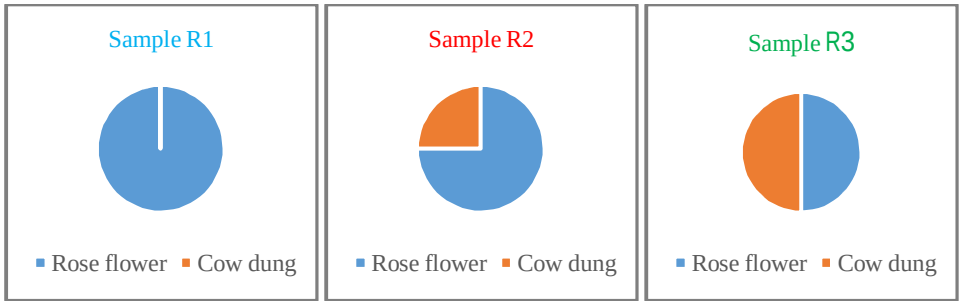


Figure 1. Percentage mixing of cow dung to rose flower.

The 45 days refers to time of initial mixing of waste after preliminary decomposition. A sample vermicompost was collected from container and dried at room temperature and store in airtight plastic vials for chemical analysis. Vermicompost were oven dried at 100°C then ground in the blender and sieved particles smaller than 2 mm in diameter were used for analysis. All the three samples were analysed for various macronutrient like organic carbon, TKN, phosphorus, potassiumetc. Analysis was done as per the methods described in the manual for the analysis of Municipal Solid Waste published by C.P.C.B, New Delhi [27, 28].

RESULTS AND DISCUSSION

Variation in total organic carbon: The percentage of organic carbon was gradually reduced. This reduction is due to the use of organic carbon by earthworms as well as this carbon acts as the carbon source for the microbial population present in the bioreactor. Table 1 and figure 2 shows variation in organic carbon.

Table 1. Variation of percentage of organic carbon

Days	% Organic carbon		
	Sample R1	Sample R2	Sample R3
45	14.7	17.8	19.67
60	13.5	14.53	15.61
75	12.7	13.6	14.8
90	12.5	12.65	12.75

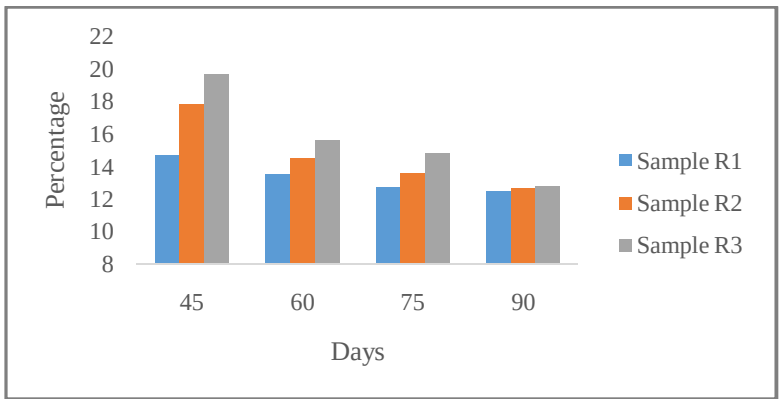


Figure 2. Variation of organic carbon

Variation in total Kjeldahi nitrogen **(TKN):** TKN increases with the days of vermicomposting as the nitrogen content in the Vermicompost is increased. During vermicomposting together with the loss in

organic carbon there is increase of nitrogen in the form of mucus, nitrogenous excretory substances growth stimulating hormones and enzymes from earthworms. Variation in TKN is shown in table 2 and figure 3.

Table 2. Variation of percentage of TKN

Days	%TKN		
	Sample R1	Sample R2	Sample R3
45	0.56	0.54	0.52
60	0.70	0.68	0.66
75	0.75	0.74	0.70
90	0.80	0.78	0.75

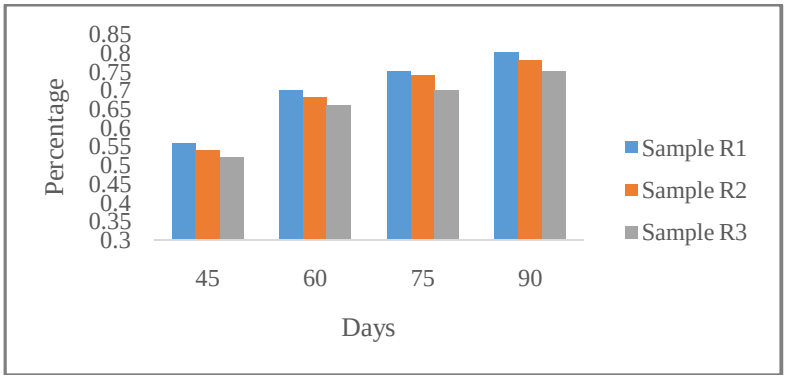


Figure 3. Variation of TKN.

Variation in phosphorus: Phosphorus content in the Vermicompost is increased. Rise in phosphorus content during vermicomposting is probably due to mineralization and mobilization of phosphorus due to bacterial and phosphates of earthworms. Table 3 and fig 4 shows the variation of phosphorus.

Table 3. Variation of Total Phosphorus

Days	Total Phosphorus		
	Sample R1	Sample R2	Sample R3
45	0.40	0.39	0.38
60	0.37	0.369	0.368
75	0.48	0.450	0.439
90	0.604	0.603	0.600

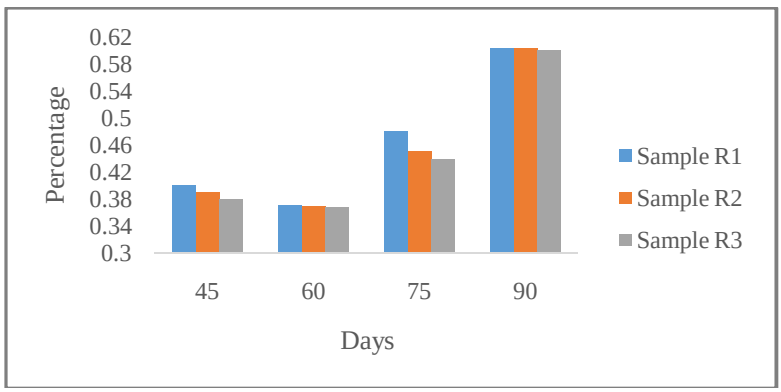


Figure 4. Variation of total phosphorus.

Variation in Potassium: Potassium content in the Vermicompost increases constantly as no. of days passes. Table 4 and figure 5 show the variation of potassium.

Table 4. Variation of Available Potassium

Days	Available Potassium (in ppm)		
	Sample R1	Sample R2	Sample R3
45	417.18	416.22	415.88
60	435.0	433.10	432.0
75	470.28	468.10	466.32
90	489.75	486.70	484

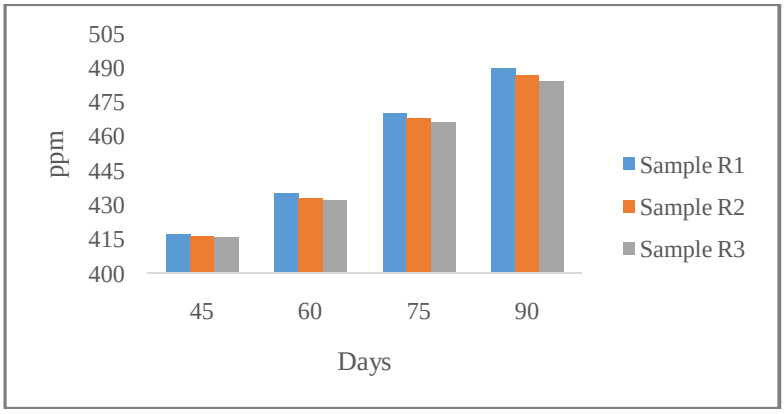


Figure 5. Variation of Available potassium.

APPLICATION

There are environmental benefits to processing organic waste into an eco-friendly by product and to averting/reducing environmental costs (such as avoiding fines due to ground water pollution caused by organic waste disposal).

The simple technology of using suitable earthworms and mixing these materials with other organic matter make them acceptable for earthworms to bring down the level of environmental pollution with minimum investment. Earthworms are biological tools in the industrial as well as agricultural farming area and they are the work force for this technology.

The vermicompost so produced has a fertilizer value. An equally it provides an environmentally begin and waste generated at worship places of different religious & faiths. It is our humble suggestion that this eco-friendly method of waste disposal should also be extended in other walk of our society.

CONCLUSION

The above result concludes that the organic worship waste material (rose flower)can be converted efficiently into vermicompost using a mixture (1:1) of *Eisenafoetida* and *Eudriluseugeniae* species of earthworms. The vermicomposting of 100% only waste rose was found to be the slowest as it took about 90 days to complete. However the time reduces gradually as the proportion of cattle dung in the floral waste was increased successively. Here an important characteristic is found that as we increase the dung percentage in the rose flower the macronutrient contents decreases proportionally.

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