

ORIGINAL ARTICLE

Determination of Micronutrients in Vermicomposte Prepared with Waste Rose Flower (*Rosa berberia*) Collected From Religious Places of Patna

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ABSTRACT

Vermi is the Latin word for worm. Vermicomposting is simply composting with worms. Vermicomposting refers to the method of converting organic waste into worm castings. It is one of the most cost efficient and environmentally friendly methods of waste disposal. Vermicomposting is increasingly becoming popular as an organic solid waste management strategy. Vermicomposting is a very effective, eco-friendly, cheap and easy method of recycling biodegradable waste using selected species of earthworms. Vermicompost have higher content of macro and micro nutrients like nitrogen, phosphorus, potassium, calcium, sodium, magnesium and micronutrients namely iron, copper, zinc and manganese which play a major role in solid waste management. The vermicoposting was prepared from waste rose flowers obtained from temples and other sources using mixed earthworms *Estina fotedia*, *Eudrilus Eugenia* species of earthworms;

Keywords: Vermicompost,; Rose (*Rosa berberia*) Wastes; *Estina fotedia*, vermiwash, macro and micro nutrients.

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INTRODUCTION

A phenomenal growth in human population, fast but unplanned urbanization, shift from traditional to modern agriculture practices etc. have led to an increased generation of waste materials. The waste materials may act as a secondary host of diseases and pests, as nature alone is unable to degrade the huge quantity of wastes in a short period of time. The proper disposal of solid waste have emerged as one of the major problems in the developing countries due to lack of limited economic resources and proper disposal techniques matching with their available resources.

Patna, the state capital of Bihar has the pride to have many famous temples, Gurudwara, Churches and Mosque (Mazar). Temples includes Patan Devi temple, Sheetla Maata temple, Mahaveer temple, Sri Premnidhi Rupkala Smarak Panch Mandir temple, and sai temple of patliputra etc. The world famous Patna Saheb Gurudwara is one of the most highly revered seat of worship of the Shikh community. The Catholic Church, the Padri ki Haveli, the Roman Catholic Archdiocese are the famous churches. At these worship places large quantity of worship items are offered to deities. The worship materials include rose flowers, leaves, fruits, sweets, jiggery, milk, and millk products, grains, etc most of which are organic biodegradable materials suitable for vermicomposting.

In the city of Patna the worship items offered by devotees of different religion and faith are dispose off in highly unscientific manner by throwing them away carelessly around nearby areas –open land and or water bodies including the river Ganga which flows through northern end of the city. At these common public places the organic wastes decay aerobically and anerobically producing foul smell toxic gases and solid liquid wastes causing severe health problems to the people around.

Rose is the only flower of choice and faith for Baba Sai Ram worshipers who offer the rose flowers on the feet of Sai Baba while worship. Sai temple of patliputra colony circle is big temple of western Patna where hundreds of Baba Sai Ram followers visit for prayers every Thursday of the week. Therefore there is huge pile of rose flowers which can be seen for disposal after the prayers are over.

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 [1].

The present research work deals that rose flower are organic in nature which is vermicomposed with ease and efficiency into good quality of manure. 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 analyzed for N, K, P availability in them and their application as a viable organic manure by using them on growth of plants.

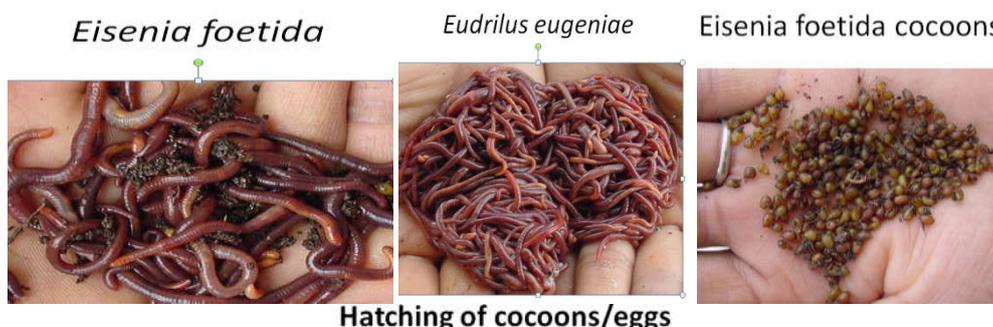
Scientific disposal and eco-friendly management of rose flowers and leaves, the main worship organic waste generated at large number of Sai temple and other worship places which are otherwise a big nuisance at places nearer to the Sai temple. Conversion of these organic wastes into excellent nutrient rich disease resistant vermicompost [2,3,4,5].

Earthworms vermicompost is proving to be highly nutritive 'organic fertilizer' and more powerful 'growth promoter' over the conventional composts and a 'protective' farm input. It increases the physical, chemical & biological properties of soil, restoring & improve its natural fertility against the 'destructive' chemical fertilizers which has destroyed the soil properties and decreased its natural fertility over the years. Vermicompost is rich in NKP (nitrogen, potassium and phosphorus), micronutrients, beneficial soil microbes and also contain 'plant growth hormones & enzymes'. It is scientifically proving as 'miracle growth promoter & also plant protector' from pests and diseases. Vermicompost retains nutrients for long time and while the conventional compost fails to deliver the required amount of macro and micronutrients including the vital NKP to plants in shorter time, the vermicompost does [6]. Increasing the vermicompost quantity resulted in increased soil zinc, manganese and iron content [7].

In short, earthworms through a type of biological alchemy are capable of transforming garbage into "gold" [8-10].

Vermicomposting is a technology that involves the Bioconversion of organic waste into bio-fertilizers by the use of the earthworms [11-15]. 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 [16, 17]. These vermicasts are rich in The macro and micronutrients of a fertilizer [18,19,20]. Furthermore, vermiwash, a brownish leachate is produced during the vermicomposting process. Vermiwash is also rich

In the macro and micronutrients of a fertilizer and can also be used as a foliar spray [21-15]. The macronutrients include nitrogen, phosphorous and potassium whereas the micronutrients include copper, iron, manganese and zinc [26].



MATERIAL AND METHODS

The solid waste of rose was collected from the Sai temple at Patliputra Colony circle a famous Sai temple of western Patna on every Thursday after the prayer time was over. We know that Sai BaBa followers offer rose flower to Sai BaBa hile performing prayers and rituals at the temple throughout the country. 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 to experimentation 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 *Eudrilus eugeniae*) 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 days²⁷

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 degree c then ground in the blender and sieved .Particles smaller than 2mm in diameter were used for analysis. All the three samples were analyzed for various physiochemical parameters. pH, Macronutrient like Total nitrogen, Available Phosphorus, total phosphorus ,Available potassium. Organic carbon and carbon: nitrogen ratio and Micronutrient like Zn, Cu, Mn, Fe. Analysis will be done as per the methods described in the manual for the Analysis of Municipal Solid Waste published by C.P.C.B., New Delh [28, 29].

RESULT AND DISCUSSION

Variation in pH:-The pH of the sample was measured after 45 days, 60 days, and 90 days of vermicomposting. The pH value gradually decreased. pH of the vermicompost sample S₁, S₂, S₃ was found to be 8.70, 8.30, 7.55. The pH shifted towards acidic range which might be attributed to mineralization of the nitrogen and phosphorus into nitrites/nitrates and orthophosphates [30]. Bioconversion of the organic material into intermediate species of organic acids.³¹ Hami and Hutha postulated that the lower pH in the final vermicompost samples might have been due to the production of CO₂ and organic acids by microbial activity during the process of bioconversion of different substrate in the feed given to earthworms.

Variation in pH :-

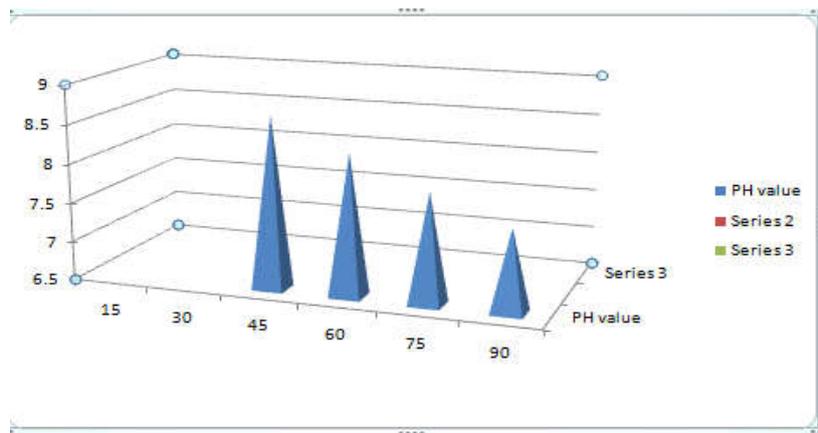


Fig 1: pH Variation in vermicompost samples

Variation in temperature:-

General rise in temperature in initial days of composting i.e. between one to four days of composting can be attributed to mineralization of organic carbon and nitrogen in the presence of adequate aeration and moisture as required by microbes responsible for decomposition and degradation of organic components.

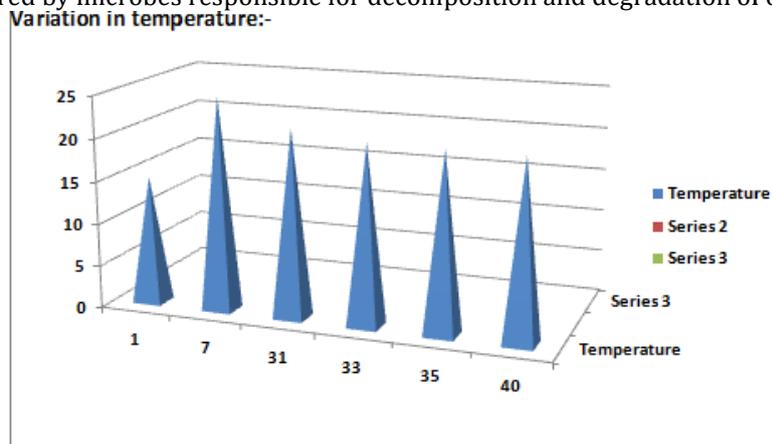


Fig 2: Temp. Variation in vermicompost samples

Variation in Total Organic Carbon and Organic Matter:-

Total Organic Carbon and Organic Matter were lower in final product of all vermicompost samples when compared with initial level in the substrate. The percentage of organic carbon for all samples percentage of organic carbon was gradually reduced from 14.7 to 12.5%. This major shift is due to the utilization of organic carbon by earthworms additionally this carbon acts as the carbon source for the microbial population present in the bioreactor. Vermicomposting process involves active participation of earthworms and microbes. The earthworms disintegrate homogenize the ingested material through foregut muscular action, supplement mucus and enzyme rich environment. This provides increased surface area for microbial action and the microorganisms perform the biochemical disintegrate. The microbes' action is absolute in the extracellular enzymatic environment by earthworms. The biological mutuality is the cause of Total Organic Carbon loss in the form CO₂ and during the decomposition and mineralization of organic waste from the substrate of rose flower the conversion of some parts of organic fraction of waste into earthworms' biomass can also reduce the carbon loss from the substrate [32].

Variation in C: N Ratio

The value of C: N for samples S₁ S₂ and S₃ decreases from 26.25%, 19.28% and 15.62% respectively as shown in above table. The C: N ratio trend is an index for maturity of organic wastes. The release of CO₂ production of mucus and nitrogenous excrements enhance level of nitrogen and lowers C: N ratio [33].

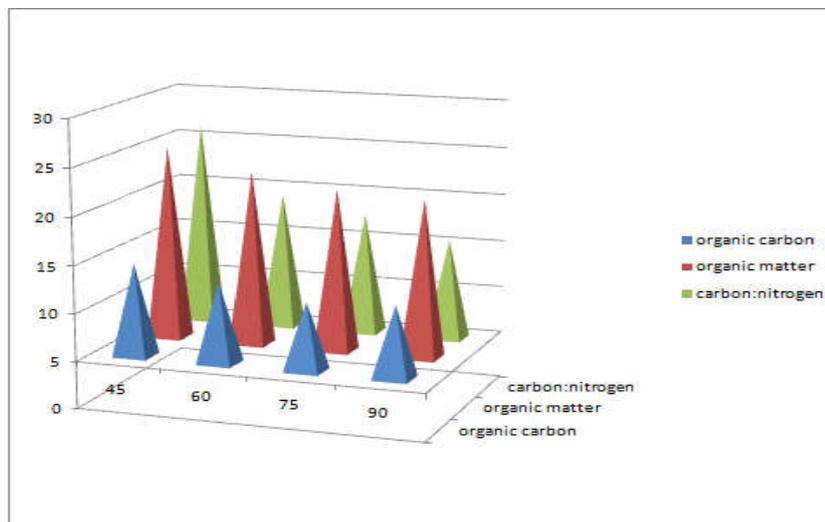


Fig 3: Variation in Total Organic Carbon and Organic Matter in vermicompost samples

Micronutrients present in vermicomposting:-

Variation of micronutrients in ppm:-

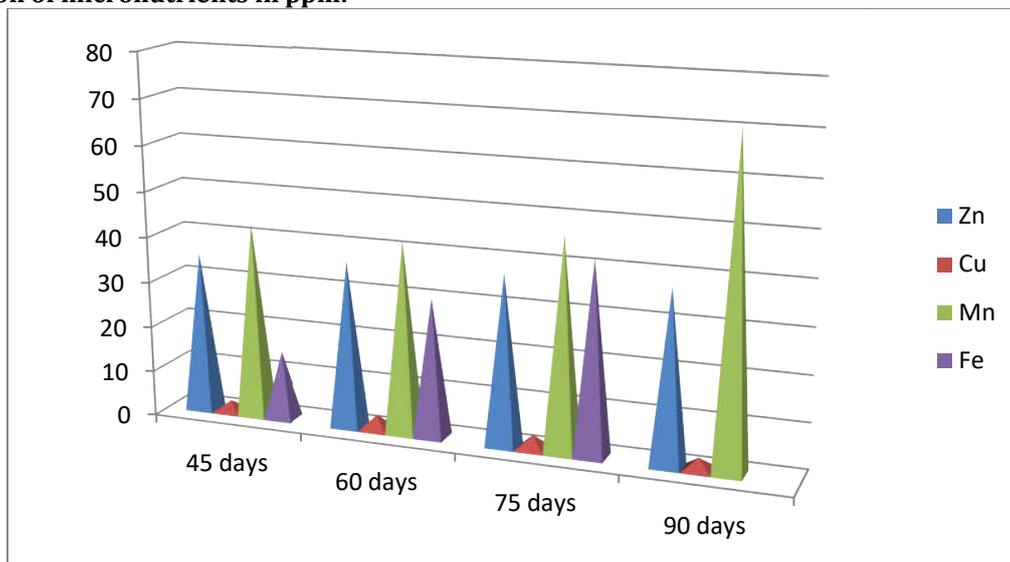


Fig 4: Micronutrients present in vermicomposting

Micro-nutrients:- Micro-nutrients such as iron, zinc, copper, and magnesium, are essential for different biological functions. It is also increased resistance to disease and insect pests and improved drought tolerance³⁴ Zn deficiency symptoms such as little leaf or rosettes were described for peach (*Prunus persica*). Soil applications are not very effective because the roots of fruit crops occupy deep soil layer and zinc does not easily move in the soil therefore, foliar sprays are more effective.

Zinc

The Zinc content of *Bauhinia purpurea* waste composted by *Eudrilus eugeniae*. The zinc content in vermicompost was found to be essential for the transformation of carbohydrates and it regulates the consumption of sugars. The soil pH is the most important factor controlling the Zn availability. The findings of the present study are in accordance with the study found that zinc content was increased in the vermicompost [35].

Iron (Fe).

Iron (Fe) is the first microelement, which is necessary for plant life. Iron plays an important role in chlorophyll biosynthesis pathway. Thus deficiency of this element reduced the net photosynthesis which causes huge reduction in fruit Yield [36].

The presence of enzymes and co-factors in the earthworm gut increased the iron content in the vermicompost. Our results are in accordance with the presence of iron content in vermicompost [37].

Copper

Higher levels of copper content in vermicompost might be due to the presence of copper containing oxidizing enzymes. Copper is responsible for healthy, vigorous growth and strengthens stalks, stems and branches. It is also necessary for the production of plant proteins [38].

Manganese

Increase of manganese content in vermicompost is due to mineralization of this element by the earthworm activity. Manganese is a catalyst for many enzymes and also facilitates the photosynthesis and chlorophyll production [39].

APPLICATIONS

The Vermicompost produced in this method has good fertilizer value. More important aspect of the present work is that it provides an environmentally benign and sustainable method for the preparation of organic fertilizer from organic wastes.

CONCLUSION

The information in this paper indicates that ROSE (*Rosa berberia*) flower waste can be converted into vermicomposting with the species of *Eisenia foetida* and *Eudrilus eugeniae*. The decomposition is indicated by decrease in C: N ratio. In the vermicomposting of rose flower Mn increases as the vermicomposting time increases. The level of Fe and Cu also increases. This shows that the earthworms enhance the nutrient values and reduced the toxic metals in the vermicomposting of waste rose flower.

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