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Recycling of Waste Rose Flower (*Rosa Berberia)* Through Vermicomposting Using Earthworm Species *Eisenia Foetida* and *Eudrilus Eugenia*

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ABSTRACT

Vermicomposting is the method of disposal of biodegradable waste using selected species of earthworms into black earthy smelling nutrient rich humus. Earthworms are considered as the friends of farmers. Vermicomposting obtained with the help of them has many benefits to soil, plants and in all to the environment. In this technique soil microflora also play important role. In the present study the nutrient status and microbiological enumeration of vermicomposting was studied. The Vermicomposting was prepared from flowers obtained from temples and other sources. Devotees of different religion and faith use different kind of worship materials while offering prayers and performing rituals at their respective places.The present research work reports the Vermicomposting of waste Rose flowers collected from the Lord Sai temples using Eisenia foetid and Eudrilus Eugenia species of earthworms in vermicomposting pit established by P.G. Dept. of Env. Sciences, A. N. College, Patna. Moisture content, temperature and pH of composting material were maintained and recorded at regular intervals. Vermicompost samples were collected separately at the end of 45 days, 60 days, 90 days and analyses for various physicochemical parameters (i.e. macronutrients) including total nitrogen, available phosphorus, total potassium, organic carbon, and C: N ratio. The results of the study are encouraging for their use as organic manure.

Keywords: Patna, State capital of Bihar Worship Places, Vermicompost; Worms; Rose (*Rosa Berberia)* Wastes; Nutrients; *Eisenia Foetida* and *Eudrilus Eugenia* species of earthworms; vermiwash.

INTRODUCTION

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. Work is on the safe disposal of huge quantum of municipal and agricultural waste.

The present study deals with the vermicomposting of Rose (*Rosa Berberia*) flower collected from the Sai temple of Patliputra colony circle using *Eisenia Foetida* and *Eudrilus Eugenia* species of earthworms. The study emphasizes that vermicomposting of temple waste is an excellent and eco-friendly method of temple waste management.

Scientific disposal and eco-friendly management of rose flowers and leaves, the main worship organic waste generated at large number of Sai temple which is otherwise a big nuisance at places nearer to the Sai temple. Conversion of these organic wastes into excellent nutrient rich disease resistant Vermicompost [1-5]. This project can act as an aid to solid waste management programme by regulating the disposal of worship temple wastes, which would otherwise create ugly scene and unhygienic condition in the vicinity of temples or pollute the river Ganga further wherein most of such wastes are disposed off by the Patna people. This programme will provide job to the technical staff member looking after these projects. This project may be given the name 'Cash from Thrash' programme, because demand for organic manure is increasing steadily that in coming few years.

The Government of Bihar has also taken a pledge that in coming few years the chemical fertilizers should be substituted fully by the organic manures. Vermicomposting is the phenomenon of compost formation of earthworms. The earthworm feed on plants refuses organic matter and digest in their guts with the help of their own enzymes. Vermicomposting is an odourless dark brown biofertilizer obtained from the process of vermicomposting. The Vermicomposting obtained are also termed vermicasts as they are expelled as casts from earthworm gut. Vermicomposting is excellent product high in nutrient content, have desirable aesthetic [6], has reduced level of contaminants, has plant growth harmones [7], higher level of soil enzymes, greater microbial population and hold more nutrients over a longer period without adversely impacting the environment [8-10].

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 [11]. It is a mesophilic process that utilizes microorganisms and earthworms that are active at 10°C to 32°C (not ambient temperature but temperature within the pile of moist organic material). The process is faster than composting; because the material passes through the earthworm gut, a significant but not fully understood transformation takes place, whereby the resulting earthworm castings (worm manure) are rich in microbial activity and plant growth regulators, and fortified with pest repellence attributes as well. In short, earthworms through a type of biological alchemy are capable of transforming garbage into "gold" [12-14].

The vermicomposting process is mesophilic process and operating condition such as temperature, pH, electrical conductivity and moisture content levels must be optimized. It is known that process such as thorough mixing of material, turning upside down and watering the components enhance the decomposition process. The turning upside down ensures an adequate supply of oxygen to the microbes. At the latter stages the turning upside down process fails to reheat the composting pile indicating that the compost material has become biologically stable. In short, participants at every stage from devotees to the technical staff members looking after these projects and farmers as the end user would be a gainer through the present scheme of research work which is environment friendly at every stage of study and implementation.

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.

MATERIALS 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 Eugenia) 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 [15].

The 45 days refers to 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^{o} 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, total nitrogen, available phosphorus, total phosphorus, available potassium, organic carbon and carbon: nitrogen ratio. 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 Delhi [16]. Total Nitrogen was determined by Kjeldahl Method. The organic phosphorus was converted into inorganic form after digestion with concentrated nitric acid, phosphorus and phosphate reacted with ammonium molybdate to form phosphomolybolic acid, which in presence of stannous ions gave a blue complex, which was determined spectrophotometrically at 690nm. Potassium was determined by using Flame Photometer.

RESULTS AND DISCUSSION

Physico-chemical parameters of the prepared Vermicompost: The results of physico-chemical parameters of prepared Vermicompost are presented in table 1

Table 1: Physico-chemical parameters of the prepared Vermicompost

Sample	Days	pH	%Organic carbon	%Organic Matter	%TKN	C:N	%Total Phosphorus
S_1	45	8.70	14.7	25.34	0.56	26.25	0.040
S_2	60	8.30	13.5	23.27	0.70	19.28	0.370
S_3	75	7.8	12.7	22.5	0.75	18.28	0.05
S_4	90	7.55	12.5	21.55	0.80	15.62	0.604

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 S_1, S_2, S_3 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 [17]. Bioconversion of the organic material into intermediate species of organic acids [18] Hami and Hutha postulated that the lower pH in the final Vermicompost samples might have been due to the production of CO_2 and organic acids by microbial activity during the process of bioconversion of different substrate in the feed given to earthworms. The variation of pH is shown in fig 1.

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. The variation in temperature is presented in table fig 2.

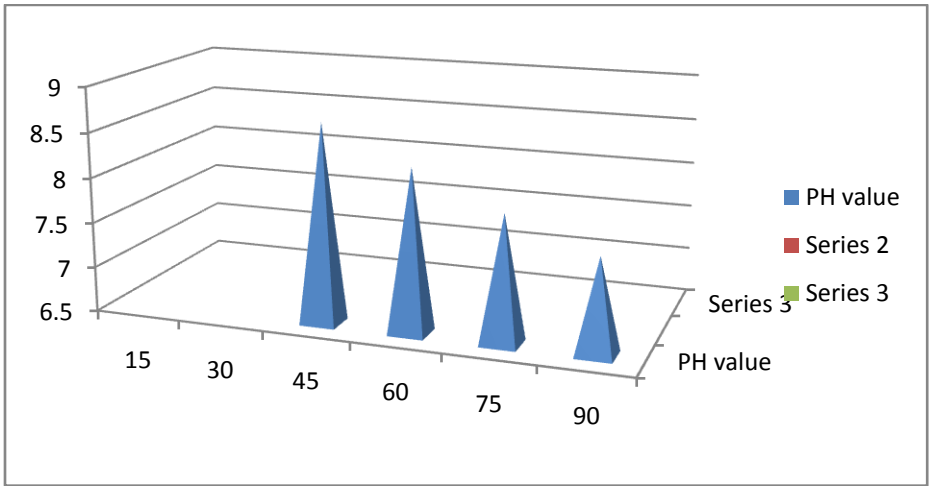

Fig. 1: Variation of pH

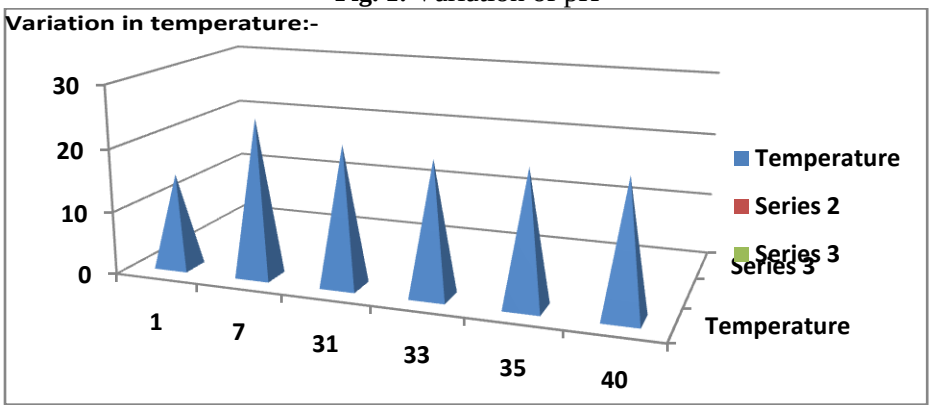

Fig. 2: Variation in temperature

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 is given in table 1 (Figure 3). 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 CO_2 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.

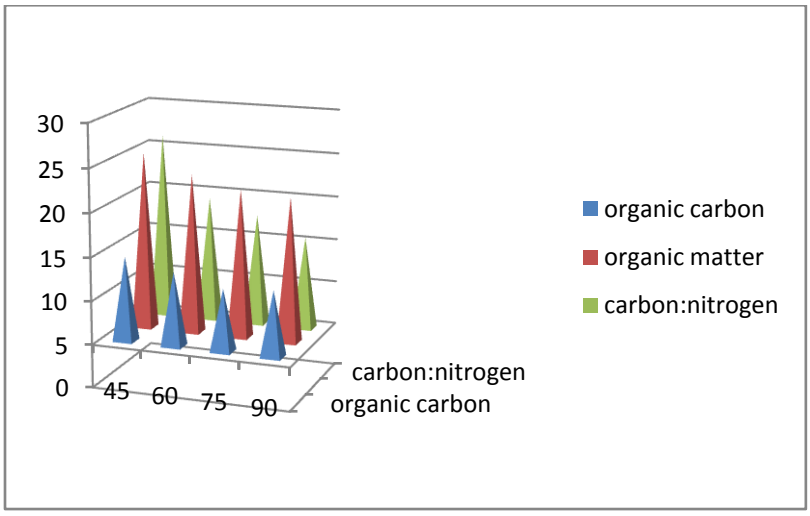

Fig. 3

Variation in TKN: TKN increases with the days of vermicomposting. nitrogen content in the Vermicompost of S_1 to S_3 increased from 0.56 to 0.80 %. For vermicomposting in addition to loss in organic carbon there is addition of nitrogen in the form of mucus, nitrogenous excretory substances growth stimulating hormones and enzymes from earthworms.

Variation in phosphorus: Phosphorus content in the Vermicompost of S_1 S_2 and S_3 increased from 0.040, 0.370, and 0.604 % respectively. Rise in phosphorus content during vermicomposting is probably due to mineralization and mobilization of phosphorus due to bacterial and phosphates of earthworms [19].

Variation in C: N Ratio: The value of C: N for samples S_1 S_2 and S_3 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 CO_2 production of mucus and nitrogenous excrements enhance level of nitrogen and lowers C: N ratio [20].

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 fertiliser from organic wastes.

CONCLUSIONS

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 Eugenia.* The decomposition is indicated by decrease in C: N ratio. The Vermicompost so produced has good fertilizer value. An equally important aspect of the present work is that it provides an environmentally benign and sustainable method of disposal of organic wastes generated at worship places of different religious and faiths.

REFERENCES

[1] L.Delgado Moreno, A Pena, Compost and Vermicompost of olive cake in Bio remediation triazines contaminated, *soil.Sci. Total Environ,* **2008,** 407, 1489-1495.

[2] J.Dominguez, M. Aira, M. Gomez –Brandon, Vermicomposting, Earthworms enhance the work of microbes, In microbes at work, ed .M. Insm, H Franke.whittle and gobernam.(eds), Boca Raton FL, 94-115, Sprengir, Berlin, **2010**.

[3] J.D. Fernandez Bayo, R. Nogales, E. Romero, Effect of vermicomposting from wastes of the wine and alcohol industries in the persistence and distribution of imidacloprid and diuron on agricultural soils, *J.Agric.Food Chain*, **2009,** 57, 5435-5442.
[4] F.Monroy, M.Aira, J.Dominguez, Reduction of total coil from number during vermicomposting is caused by short term direct effects of slurry, *Sci.Total Environ*, **2009,** 407, 5411-5416.
[5] S Gajalakshmi, S.A. Abbasi, Effect of the application of water hyacinth compost /vermicompost on the growth and flowering of crossandra undulaefolia and on several vegetables, *Bioresour Technol*, **2002,** 85,197-199.
[6] S Gajalakshmi, S.A. Abbasi, Neem leaves as a source of fertilizer fun-pesticide vermicompost, *Bioresour Technol*, **2004,** 92, 291-296.
[7] M, Manna, M. Singh, S. Kundan, A.K. Tripathi, P.N.Takkar, Growth and reproduction of the vermicomposting earthworm, Perionyx excavates as influenced by food materials, *Boil Fertil.Soils*, **1997,** 24,129-132.
[8] M. Aira, J. Dominguez, Optimizing vermicomposting of animal wastes; Effects of dose of manure application on carbon loss and microbial stabilization, *J.Envirom.Manage*, **2008,** 88, 1525-1529.
[9] M. Aira, J. Dominguez, Microbial and Nutrient Stabilization of two animal manure after the transit through the gut of the earthworm Eisenia ftida (Saving,1826), *J. Hazard.Mater*; **2009,** 161,1234-1238.
[10] M. Gandhi, V. Sangwan, K.K. Kapoor, N. Dilbaghi, *Journal of Environment and Ecology*, **1997,** 15, 432-434.
[11] Bhandauria T and Ramkrishnan PS.Role of earthworm in nitrogen cycle during the cropping phase of shifting agriculture in northeast India, *Biology and Fertility of Soils*, **1996,** 22,350-354.
[12] Vermi Co, Vermicomposting technology for waste management and agriculture: An executive summary, http://www.vermico.com/summaryhtm, **2001.**
[13] Tara Crescent, Vermicomposting. Development Alternatives (DA) sustainable livelihoods. http://www.dainet.org/livelihoods/default.htm, **2003**.
[14] Asha kumara, Bihari Singh and Tripti Gangwar, Recycling of organic wastes of sugarcane bagasse and Poultry waste through vermicomposting using earthworms species *Eisena foetida* and *Edurilus Eugenia*: analysis of mcronutient, *Asian Journal and Env.Research*, **2013,** 6(3-4), 52.
[15] P.K.Behra, soil and solid waste analysis a laboratory manual Dominant, Published ISBIN 8178884062, **2005.**
[16] P.M.Ndegwa, S.A.Thompson, K.C.Das, Effects of stocking density and feeding rate an vermin compostng of Bio solids, *Biores Technol* **2000,** 71, 5-12.
[17] J.Hami, V. Hutha, capacity of various organic residues to support adequate earthworms; biomass in vermicomposting, Bio.Fertil.Soil, **1986,** 2, 23.
[18] E.Bentiz, R. Nogales, C. Elivira, G. Masciandaro, B. Ceccant, Enzymes Activities s indicators of the stabilization of sewage sludge composting with *Eisena foetida, Bioresource Technol*, **1999,**67, 297-303.
[19] R.V.Krishnamoorthy**,** mineralization of phosphorous by faceal of some earthworms of Indian tropics In proceedings of Indian Academy of Sciences, *Animal Sciences*, **1990,** 99, 509.
[20] B.K Senapati, M.C.Dash, A.K Rane, B.K Panda**,** observation on the effect of earthworms in the decomposition processes in soil under laboratory conditions, *Comp.physiol Ecoil*, **1980,** 5,140.

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