iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** VII **Month of publication:** July 2018

DOI: http://doi.org/10.22214/ijraset.2018.7130

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue VII, July 2018- Available at www.ijraset.com

Vermicomposting of different Varieties of Leaves (Difference in the Growth Rate of Earthworms & Quality of Manure)

Brijesh Giri[1], Prof. Deepak Rastogi[2]
[1]*M.Tech. Student, Environmental Engineering, MITS, Gwalior (M.P.)*
[2]*Associate Professor, Department of Civil Engineering, MITS, Gwalior (M.P.)*

Abstract: ***Five different samples of vermicomposting were prepared for testing of the quality of different vermicomposts and growth rate of earthworms. We have used one sample of mixed leaves, and other samples for particularly a single type of leaves as Neem, Sheesham, Sagwan, and Ashoka. Each vermicompost sample is tested for its physical and chemical characteristics individually and also for the differences in their rate of growth of earthworms. Test results showed that the ashok laves sample turned into better quality of vermicompost in comparison to the other four samples. The growth rate of earthworms was maximum found in sagwan leaves i.e. 78.33% and minimum growth rate was found in ashok leaves sample.***
Keywords: vermicomposting, Eisenia foetida Earthworm, neem tree (Azadirachta indica), sheesham (Dalbergia sissoo), Ashoka (Saraca asoca), sagwan tree (Tectona grandis)

I. INTRODUCTION

A huge amount of waste is produced in our country every day. It is increasing rapidly due to high population growth, urbanization and industrialization. This waste is collected on a storage site, landfill sites or thrown into water bodies, hence polluting the soil, air as well as water bodies. We all know that at present we have not provided arrangements to fix this issue in such a way that there are minimum consequences to the environment. Out of this total waste, a major portion of organic waste is produced which can be altered as a useful product which, instead of harming the nature, can be beneficial for the soil and environment. One of such solutions, we can adopt is vermicomposting in which organic waste can be converted into high quality rich nutrients compost which when applied on soil reverse the process of soil contaimination into soil enrichment and conditioner Vermicomposting is the process of converting organic wastes into high quality compost which is free from harmful and toxic chemicals. Earthworms play the major role in formation of vermicompost. Earthworms belong to phyllum Annelida of Animal Kingdom. They are long and cylindrical in shape and size having a large number of grooves. There are about 3000 species of earthworms in the world which are adapted to a range of environment. More than 300 species have been identified in India. Although, hermophrodite, two mature earthworms are required to propagate. At the time of egg laying, the clitellum is transformed into hard, girdle like capsule called cocoon. Shedding of cocoon ranges from 1 to 5, only a few of them survive and hatch. The juveniles and again formation of cocoons takes a period of 50-60 days. Normally, the average life span of earthworms varies with species ranging from 1 to 10 years. We have used eisenia foetida earthworm in our vermicomposting process. When the earthworms consume organic material, microorganisms also reach into their bodies and participate in metabolism of organic matter. Vermicompost and other agricultural waste are very important for maintaining the soil organic matter and to manage soil productivity. We have huge amount of agricultural and animal waste but due to improper attention and attitude toward the nature and quality, huge loses to the manure characteristics such as loss of nitrogen on the heap cores of cows and buffaloes excreta with the time occurs. This nitrogen in the form gas contribute in the air pollution, hence instead of taking its benefit for a effective manure, we are letting it polluting the air. Similarly, lots of leaves litter in tonnes is wasted by throwing it on the dumping yard or landfills. These leaves litter can be utilized in making a very fertile and rich nutrients manure. In every institution, industry and colony, a huge amount of leaves litter is collected and thrown as a municipal waste. Instead of throwing it, if it is collected and provide to earthworms as food in the process termed as vermicomposting , a huge amount of organic manure will be produced which will be free from chemicals and toxic substances called as vermicompost. This compost can be applied to the soil for the plantation and crops. It is proved to be a great soil conditioner and also the results are much better than any time of fertilizer used in the gardening and cropping.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue VII, July 2018- Available at www.ijraset.com

II. MATERIALS AND METHODOLOGY

As the pit method is used for preparation of vermicompost, five samples of vermicompost were prepared by digging out five pits each of same of similar size i.e.
Length=1ft, Width=1ft and; Depth=1ft Materials required for the preparation of each sample is as follows

A. Cowdung, Eisenia Foetida Earthworms, Leaves, Jute Cover (for Shading purpose), Polyethene

In each sample, there was equal amount of proportioning mixture is carried out, difference is only the application of different varieties of leaves i.e. for 1st sample, sheesham leaves litter are used, for 2nd sample, ashoka leaves are used, for 3rd sagwan leaves litter are provided, 4th sample has neem leaves and final sample carry out the mixing of above types of leaves. Quantities of earthworms provided were also in the same amount i.e. total earthworms taken were equal to 200 gm; hence 40 gms of earthworms were left in each pit. After the samples were put in the pits, it was covered by the jute bags from the prevention of direct sunlight, as the earthworms do not like sunlight at all. Water was sprayed on each sample for providing adequate amount of moisture. Temperature of 27 degree was recorded. After the sprinkling of water continuously for 20 days, weight of each sample was checked individually. It was found to be

1) 4.3 kg for sheesham leaves sample
2) 4.8 kg for ashoka leaves sample
3) 5.2 kg for sagwan leaves sample
4) 5.3 kg for neem leaves sample
5) 5.5 kg for mix leaves sample

The total time has been taken for the completion for vermicomposting process here is 60 days. After continuous supervision of samples, minimum time required for the completion of vermicomposting process here is 60 days.

III. RESULTS AND DISCUSSION

A. Chemical Characteristics

Each sample was checked for different parameters after the completion of 60 days period to find out the quality of compost of each vermicompost sample.

Parameters	Mixed leaves sample	Neem leaves sample	Sheesham leaves sample	Sagwan leaves sample	Ashok leaves sample
pH	6.4	6.3	6.2	6.1	5.9
Electrical conductivity (mmho/cm)	0.33	0.31	0.31	0.34	0.32
Nitrogen (%)	1.2	1.5	1.4	1.4	1.6
Phosphorus (%)	0.22	0.21	0.23	0.18	0.20
Potassium (%)	0.41	0.36	0.37	0.38	0.42

B. Earthworms/Biomass Growth Rate Calculation

To calculate the growth rate of earthworms, a formula by Suthar in 2006 was used to determine the worm growth response

Growth rate determination (R) = (N2-N1)/T

Where,

R=Growth rate
N1=Initial earthworm biomass (gm)
N2=Final earthworm biomass (gm)
T=Time period of the experiment in days

Earthworm growth rate has been individually calculated for each sample to find out the maximum to minimum growth rate in a sequential manner. To achieve the right quantity of earthworms, the earthworms were manually extracted from the each sample and weighed.

After the completion of vermicomposting process for the period of 60 days the weight of earthworms was calculated for each sample individually.

Type of vermicomposting sample	Initial weight	Final weight
Mixed leaves	40 gms	52 gms
Neem leaves	40 gms	64 gms
Sheesham leaves	40 gms	78 gms
Sagwan leaves	40 gms	87 gms
Ashok leaves	40 gms	48 gms

The earthworms were taken from the sample by seiving it through a mess and manually collected carefully and washed. The weight of earthworms was taken individually for each sample and hence the growth rate was calculated with the help of suther's formula stated as above and their values in percentage are as given below in tabular form.

Type of vermicomposting sample	Growth rate
Mixed leaves (R1)	20%
Neem leaves (R2)	40%
Sheesham leaves (R3)	63.33%
Sagwan leaves (R4)	78.33%
Ashok leaves (R5)	13.33%

Minimum to maximum growth rate can be written as

R5<R1<R2<R3<R4

As we can see that the maximum growth rate of earthworms was achieved by sagwan leaves sample whereas the minimum growth rate was achieved by Ashok leaves sample.

IV. CONCLUSION

This study is carried out only on the five different varieties of leaves whose results show that the vermicompost can be made up of the leaves litters instead of wasting or throwing it. The study of these five types of leaves sample showed the kind of leave which is better to produce good quality of vermicompost in comparison to other four samples and also the difference in their rate of growth of earthworms.

A. As we can see the pH of mixed leaves was higher than any other sample and electrical conductivity of sagwan leaves was higher

B. Ashoka leaves sample has the higher value of nitrogen and potassium than any other sample .Hence we can see the quality of vermicompost was well produced by ashok leaves sample

C. The growth rate of earthworms is not maximum in ashoka leaves sample, the growth rate of earthworms was maximum achieved by sagwan leaves sample (78.33).In terms of higher production of earthworms ,we can take sagwan leaves as much as possible

D. Total weight of earthworms after the period of 60 days of all the samples is 329 gms whereas initial weight of total earthworms was 200 gms.

REFERENCES

[1] Sartaj Ahmad Bhat, Jaswinder Singh, Adarsh Pal Vig, Effect on Growth of Earthworm and Chemical Parameters during Vermicomposting of Pressmud Sludge Mixed with Cattle Dung Mixture. Procedia Environmental Sciences 35 (2016) 425 – 434.

[2] E. Albanell , J. Plaixats , and T. Cabrero , Chemical changes during vermicomposting *(*Eisenia fetida) of sheep manure mixed with cotton industrial wastes. Bio Fertil Soils (1988) 6:266-269

[3] Jaya Nair, Vanja Sekiozoic, Martin Anda EVect of pre-composting on vermicomposting of kitchen waste bioresource technology 97 (2006) 2091–2095

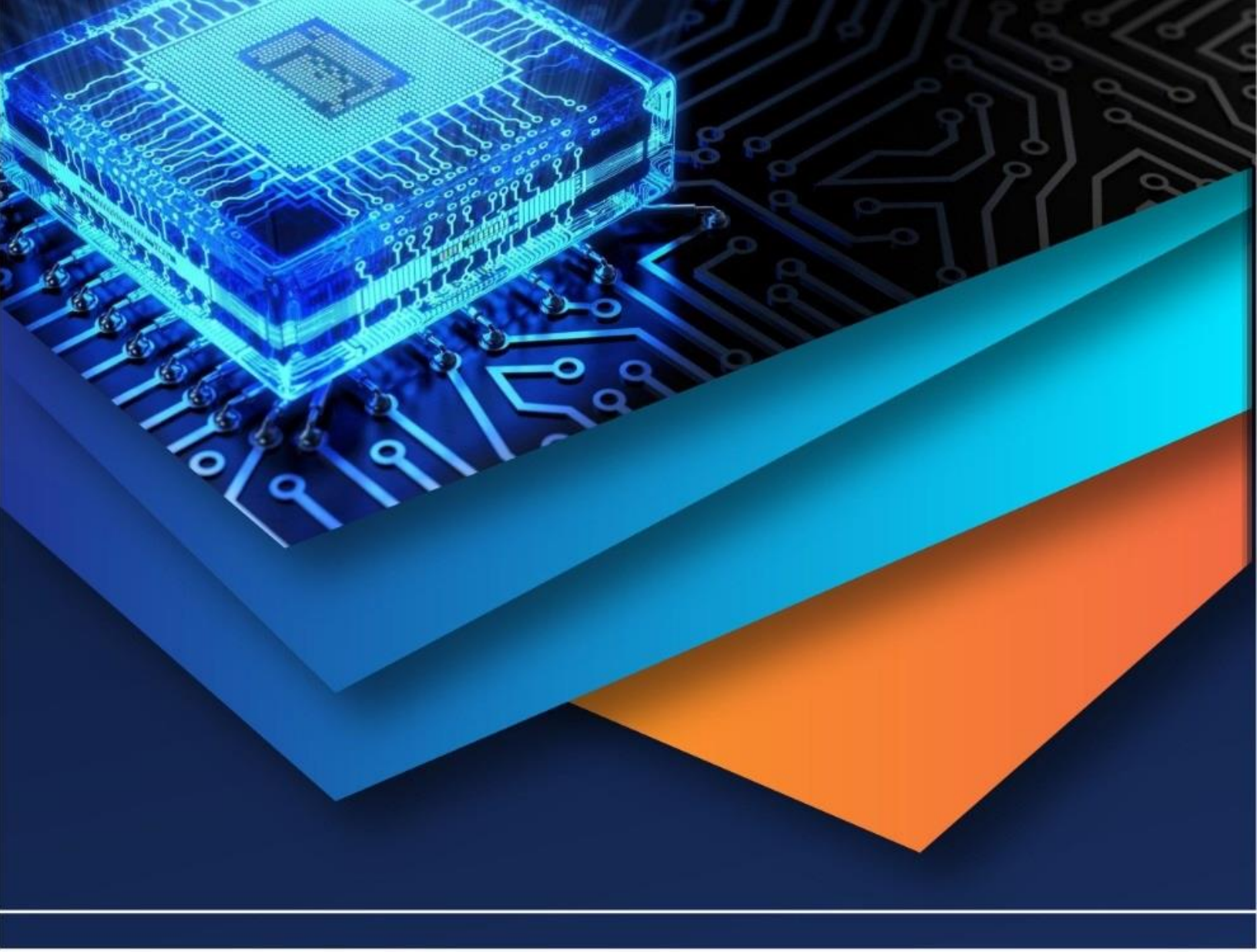
[4] Niño A.[1], Escobar A[2], Zamora M. E.[3], and Martínez U Design and construction of a unit for the production of vermicompost from cattle-equine organic waste. European Journal of Experimental Biology, 2015, 5(1):48-55

[5] Nagavallemma KP, Wani SP, Stephane Lacroix, Padmaja VV, Vineela C, Babu Rao m. Organic, Fertilizer Vermicomposting: Recycling waste into valuable Organic Fertilizer on agrecosystems report no. 8. patancheru 502 32

[6] Manaig Elena M. Vermicomposting Efficiency and Quality of Vermicompost with Different Bedding Materials and Worm Food Sources as Substrate issn: 0976-3031 volume: 6(12) december -201

[7] k. muthukumaravel, a. amsath* and m. sukumaran, Vermicomposting of Vegetable Wastes Using Cow dung issn 2320-6063Vol. 4(1), 1-13, january (2016) *res.* j. agriculture and forestry sci

[8] Potential Of Vermicompost Produced From Banana Wast (Musa paradisiaca) On The Growth Parameters Of Solanum lycopersicum issn: 0973-4945; coden ecjhao e-journal of chemistry vol. 5, no.4, pp. 810-813.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY