WWJMRD 2021; 7(4): 112-115
www.wwjmrd.com
International Journal
Peer Reviewed Journal
Refereed Journal
Indexed Journal
Impact Factor SJIF 2017: 5.182 2018: 5.51, (ISI) 2020-2021: 1.361
E-ISSN: 2454-6615

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Vermicompost of Organic Wastes by Using Epigeic Earthworm

Dr. S. Sathiyavathi and V. Pavithravedhavalli

Abstract
Vermicomposting is the process of decomposition of organic wastes by using earthworms. In this study, the organic materials like fruit peels, cow dung and coconut wastes are used for decomposition. Vermicomposting is done by using epigeic earthworm *Eudrilus eugeniae.* After the composting period the worm casts are harvested and also examined under the various analytical methods to know its nutrition value. Through these analytical examinations, there is an evident of increasing macro and micro nutrients of the soil. It also increases the fertility of the soil.

Keywords: Vermicomposting, Epigeic earthworm and soil fertility

Introduction
The biotechnological decomposition of organic wastes by using earthworm is called vermicomposting. In this process the wastes are converted into valuable manures and also increase the economic value. It gives immense fertilizer as well as money. Due to this process we can get valuable yield called as vermicompost or worm cast which is highly nutritive and increases the soil quality. Vasanthi et al.,2012. It has 5-7 times more nutrients than the other composts. Gajalakshmi et al., 2002.
Earthworm excretes a minute granule which contains more nutrients like NPK, micro nutrients, beneficial soil microbes, Nitrogen fixing bacteria, actinomycetes, phosphate solubilizing bacteria and plant growth promoters like auxins, gibberellins and cytokinins. These minute granules are creates the miraculous changes in the terrain environment. Sumathi S and Pawlin Vasanthi Joseph., 2018.
In this study, organic wastes like banana peel, cowdung and coir wastes are used for decomposition by using epgeic earthworm *Eudrilus eugeniae.* Which gives better quality compost and compost the waste faster.

Materials And Methods
The compost was prepared with four different setups. For experimental purposes four plastic tubs were maintained namely A- Banana peel; B- Cow dung; C- Control soil; D- Coir waste. The organic materials were mixed with soil for decomposition up to 30days.
Physicochemical parameters were analyzed to check the nutrient content, viability and nature of the soil. Physical parameters like Moisture (%), Temperature (ºC) and chemical parameters like pH, Organic Carbon (%), Nitrogen (%), Potassium (%), Phosphorus (%), C:N ratio, Iron (ppm), Manganese (ppm), Zinc (ppm), Copper (ppm) and Electric Potential of soil. Trivedy and Goel (1986) and Tandon (1993), Page et al. (1982).

Calculation For Organic Carbon (Walkley-Black method, FAO United Nations, 2019)

$$\text{Organic Carbon \%} = \frac{(V_b - V_s) \times M_{Fe^{2+}} \times 0.39}{W}$$

Where,
V_b = Volume of titrant blank in ml

V_s = Volume of titrant sample in ml
M_{Fe}^{2+} = Molarity of FeSO4 solution
0.39 = $3 \times 10^{-3} \times 100 \times 1.3$, where 3 is equivalent weight of Carbon and 1.3 is correction factor.

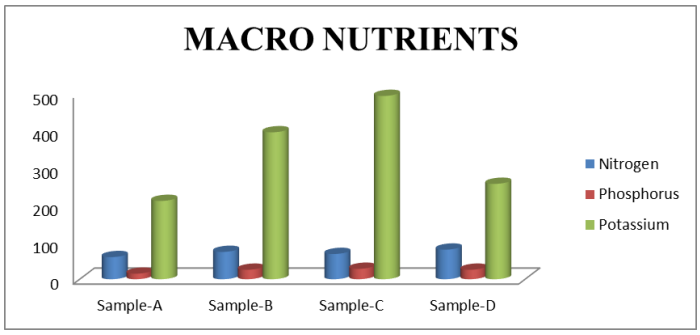
Calculation For Nitrogen
Weight of the sample taken = 1g
Volume of 0.1N Sulphuric acid taken in the beaker to absorb ammonia =Xml
Volume of 0.1N Potassium hydroxide used for back titration = Y ml
Actual volume of 0.1N Sulphuric acid consumed to absorb ammonia = X-Y ml
1ml of 0.1N Sulphuric acid = 0.00014g of N
Percentage of Nitrogen in the sample =0.00014 × (X-Y) × 100/1 = ———— %

Procedure For Analysis of Micronutrients
10g of sample was taken into test tubes and add 10ml of triple acid and digest the samples over heated in stand bath, made up to 100ml distilled water. The contents were directly fed into atomic absorption spectrophotometer with different nanometers like 248.3nm for Fe, 213.9nm for Zn, 279.5nm for Mn, 324.3nm for Cu. The corresponding ppm was read from the standard curve drawn.

Result
Macronutrients are more important nutrients for the soil viability and plant growth factors. In the current study, Nitrogen and content was higher in control and cow dung than the other samples. Phosphorous content was high in banana waste follows control and cow dung has equal amount of phosphorous and which very low in coir waste. Potassium is a very essential nutrient for plant growth and disease resistant of the plant. Banana waste compost has more potassium content than the other sample, naturally banana very rich in potassium; hence the compost has higher potassium content.

Table 1: Analysis of Macronutrients in the selected samples and control.

Parameters	Sample-A	Sample-B	Sample-C	Sample-D
Nitrogen	59.6	73.6	68	79.7
Phosphorus	14.9	25.5	28	25.5
Potassium	211	396	494	257



Sample A– Control, Sample B – Cowdung, Sample C – Banana peel, Sample D – Coir waste.

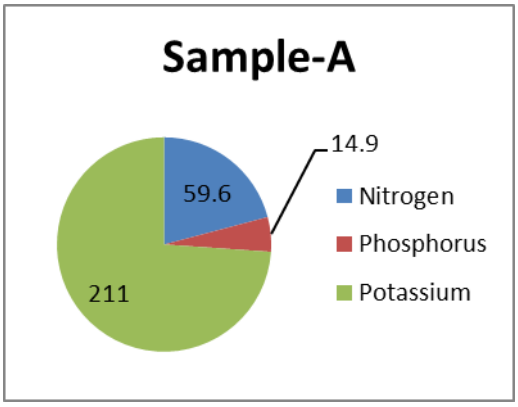


Fig. 1: N_2, P_2 and K_2 in the control sample.

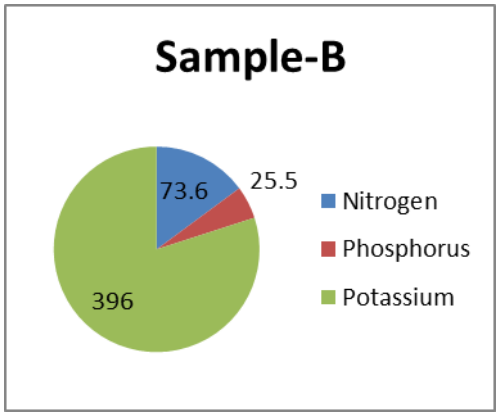


Fig. 2: N_2, P_2 and K_2 in the Cow dung.

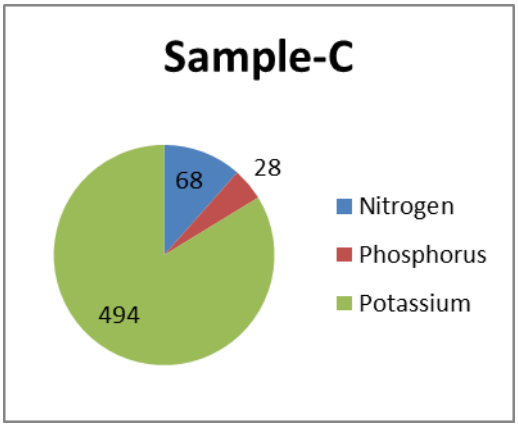


Fig. 3: N_2, P_2 and K_2 in the Banana peel.

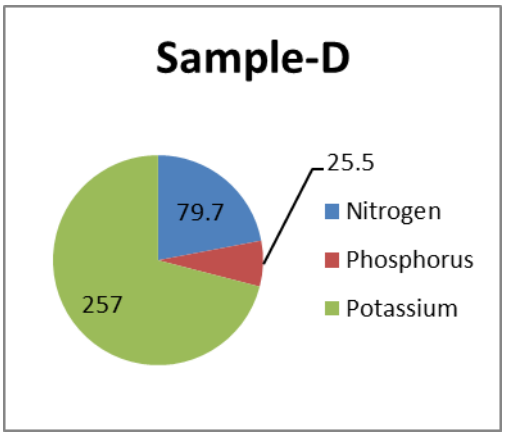


Fig. 4: N_2, P_2 and K_2 in the Coir waste

Analysis of Micronutrients (Fe, Zn, Cu and Mn)

Micronutrients plays a major role in the plant growth and soil viability. They are consumed by plant for growth, disease resistant and productivity.

Table 2: Analysis of Micronutrients in the selected samples and control.

Parameters	Sample-A	Sample-B	Sample-C	Sample-D
Fe	6.1	4.8	5.1	5.8
Mn	2.56	2.4	2.8	2.3
Zn	0.71	0.82	0.91	0.74
Cu	0.46	0.42	0.47	0.61

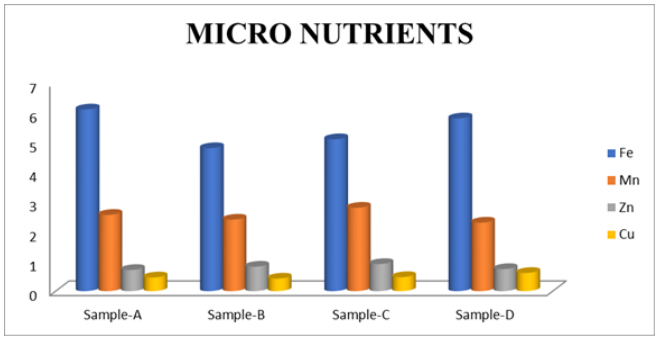


Fig. 5: Analysis Micronutrients in the selected sample and control.

Sample A– Control, Sample B – Cowdung, Sample C – Banana peel, Sample D – Coir waste

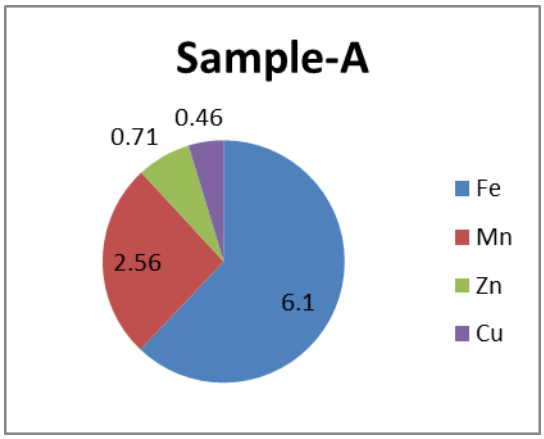


Fig. 6: Fe, Mn,Zn,Cu in the control sample

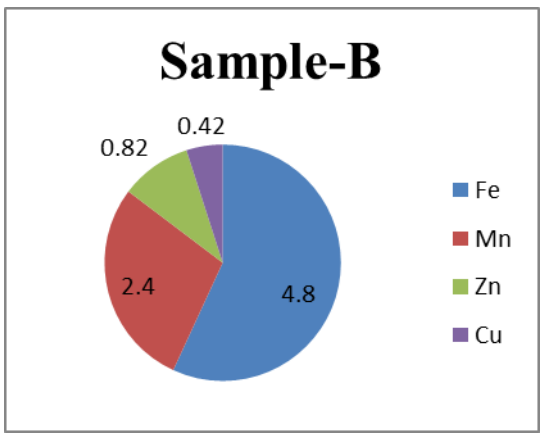


Fig. 7: Fe, Mn,Zn,Cu in the Cow dung

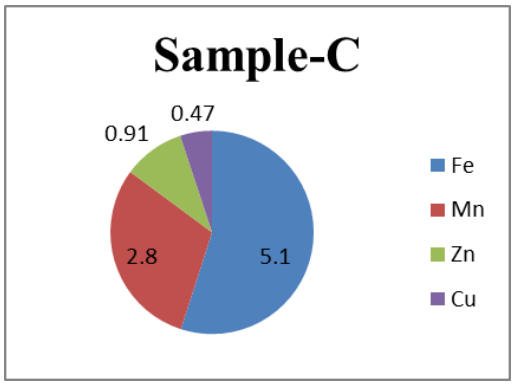


Fig. 8: Fe, Mn,Zn,Cu in the Banana peel.

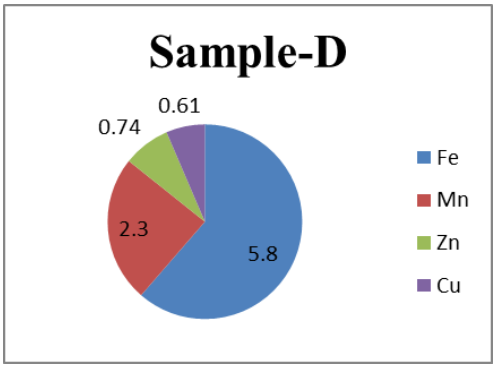


Fig. 9: Fe, Mn,Zn,Cu in the Coir waste

Discussion

In the vermicompost of different organic materials, Nitrogen content was very high in sample- D (coir waste) than the organic materials following this, Potassium and Phosphorous was very high in sample – C (Banana peel). So, the macro nutrients will increase the soil fertility by the continuous using of banana peel as composting material than the other organic materials.

Among the samples, micronutrients like Fe and Cu is high in sample – D (coir waste) as well as Mn and Zn is increased in sample – C (Banana peel) than the other samples. The ph level of the banana vermicompost is 8.4, which is lower than the study of Lakshmi prabha et al., 2013 shows 7.7- 6.9 pH in control and banana compost respectively. pH of Patil et al., 2018 shows lower pH value (6.3) than the current study. Phosphorus content was very lesser than the current result compared with the study of Lakshmi prabha et al., 2013. Potassium level is more or less equal to the study of Lakshmi prabha et al., 2013.Micronutrients are comparatively higher in banana wastes and similar to coir wastes, Patil et al., 2018 and Lakshmi prabha et al., 2013.

According to the current study, the vermicompost of Banana peel and coir waste is increased the nutrient contents of soil and its fertility. The nutrient contents were preferably high in those two samples. Hence, based on the nutrient need of soil, above these two vermicomposts were preferred as an alternative for chemical fertilizers to increase the soil fertility and the growth of soil without affecting it' s nature.

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