WWJMRD 2023; 9(03): 55-59
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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Utilization of N P K content of vermicompost by Using Eudrilus eugeniae Earthworm

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Abstract
Vermicomposting has been practiced for many years by several researchers for its positive outcomes toward sustainable agriculture. This study was conducted to assess the N, P, K content of vermicast as influenced by different substrates. Approximately, four (4) samples in each substrate as initial sample and vermicast as final sample were collected in the study. Varying substrates include the use of onion peel, orange peel, vegetable wastes, some vegetable plants namely Solanum lycopersicum (tomato), Solanum melongena (brinjal), Capsicum annum (chilli). Thus, vermicomposting is done by using Eudrilus eugeniae earthworm.

Keywords: Vermicomposting, Eudrilus eugeniae & N, P, K.

Introduction
Vermicomposting is the process of producing organic fertilizer or the vermicompost derived from different substrates and biodegradable materials that are processed by earthworms. Composting with earthworms lessens the disposal of agricultural wastes and increase the benefits of high-quality compost (Rogayan, et al., 2010).
Vermicomposting is a simple biotechnological process of composting in which certain species of earthworms are used to enhanced the process of waste conversion and produce a better product. The resulting product of vermicomposting is commonly known as 'vermicast'. Vermicast is an organic fertilizer which is of high quality and it is very useful in enriching the soil as soil conditioner (vermin Co. 2001 as cited by Ranin, 2015). This study was conducted to assess the nutrient content (NPK) of vermicast by Eudrilus eugeniae when fed with different mixtures of substrates. This research also aims to identify the changes of nutrient content of the different substrates after the vermicast production.

Materials and Methods
The compost was prepared with four different setups. For experimental purposes four plastic tubs were maintained namely A-Onion peel, B-Orange peel, C-Vegetable waste and D-Control soil. The organic materials were mixed with soil for decomposition upto 45 days.
Earthworms are collected from the vermicomposting center of Krishnagiri District (Paiyur). Eudrilus eugeniae species of epigeic earthworm used for the preparation of vermiwash.
Physical parameters like Moisture (%), Temperature (°C) and chemical parameters like Ph, Organic Carbon (%), Nitrogen (%), Potassium (%), Phosphorus (ppm) C:N ratio, Iron (ppm), Zinc (ppm), Copper (ppm), Manganese (ppm) and Electric potential of soil. (Hemant Samadhiya et al., 2013).

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

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

Where,

V_b = Volume of titrant blank in ml

Vs = Volume of titrant blank in ml

Molarity of FeSo4 solution
$3 \times 10^{-3} \times 100 \times 1.4$, where 4 is equivalent weight of sample and 1.4 is correction factor.

Procedure for Analysis of Macronutrients

Procedure of sample taken into test tubes and add 10 ml of Sulphuric acid and digest the samples over heated in stand bath, upto 100ml distilled water. The content was their fed into atomic absorption spectrophotometer with different nanometers like 204.6 nm for Fe, 118.8 nm for Zn, 304.5 nm for Mn, 424.2 nm for Cu. The corresponding ppm that read from the standard curve drawn. The level of nutrients in compost depends upon the source of raw material and the species of earthworm. A fine worm cast is rich in N P K besides other nutrients.

Micronutrients are essential elements needed for crop growth that are required in relatively small quantities**.** Even though demands for micronutrients directly affect crop growth and development. Micronutrients include elements such as Fe (Iron), Mn (Manganese), Zn(Zinc) and Cu(Copper) are the micronutrients of soil. Fe involves in the process of synthesis of chlorophyll, Mn involves in photosynthesis, Zn involves in weather resistance and Cu involves in respiratory and metabolic chains.

The macro and micronutrients were increased after the vermicomposting. Plant growth and development are largely determined by nutrient availability; therefore, to ensure better productivity of crop plants, it becomes essential to understand the dynamics of nutrients of nutrients uptake, transport, assimilation and their biological interactions **(**Wawrzynska and Sirko, 2014).

Plant Growth and Productivity

Plants like other so called higher organisms, do not exist as entities unto themselves. They are biotic systems which consist of the plant plus innumerable microorganisms, the plant micro biome. This review considers plant associated bacteria and fungi, focusing on those that internally colonize plant roots as microbial endophytes. Plants, together with their associated micro biomes, function as complex multi-species entities referred to in the literature as holobionts (Margulis and Fester, 1991). The association can be detrimental to the plant if pathogens predominate, or it can be neutral. More often, it results in plants having better health, growth and performance. We are previously discussed endophytic root colonization and the resulting symbiotic increases in plants capabilities using the concept of Enhanced plant Holobionts (EPHs; (Harman and Uphoff, 2019).

Result

Vermicompost is nutritionally rich natural organic fertilizer, which release nutrients in the soil and improves quality of the plants with renewed of physical and biological properties of soil. In the current study, nitrogen and content was higher in control and onion peels and the other samples. Phosphorous content is low in coir waste. Potassium is a very essential nutrient for plant growth and this highest value of macro and micro plants. Orange peel compost has the nutrient soil potassium content than the other sample, naturally vegetable waste is very rich in potassium; hence the compost has potassium content.

Analysis Of Macronutrients Before Vermicomposting Control Sample

Table 1: Macronutrients in Control.

Nutrients /No of Days	0-30 Days (%)	30-60days (%)	60-90days (%)
Nitrogen	60	60	60
Phosphorus	5	5	5
Pottassium	198	198	198

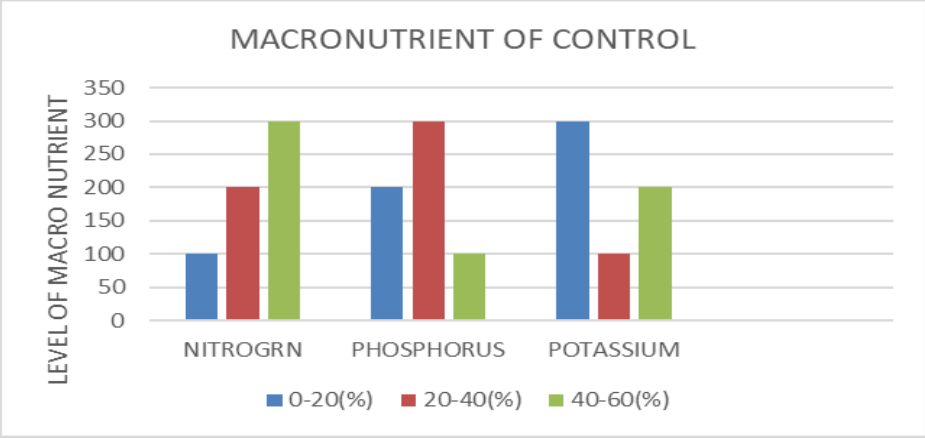

Fig 1: Onion Peel Vermicompost.

Table 2: Macronutrients in Onion Peel Vermicompost.

Nutrients /No of Days	0-30 Days (%)	30-60days (%)	60-90days (%)
Nitrogen	72	90	150
Phosphorus	8	30	40
Pottassium	380	480	500

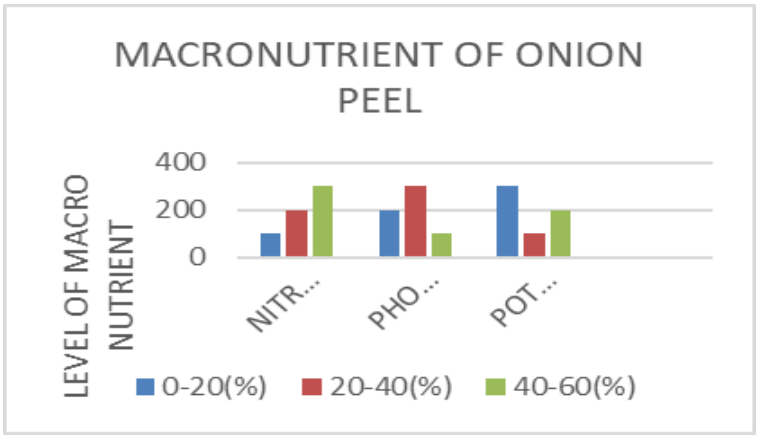

Fig 2: Orange Peel Vermicompost.

Table 3: Macronutrients in Orange Peel Vermicompost.

Nutrients /No of Days	0-30 Days (%)	30-60days (%)	60-90days (%)
Nitrogen	70	75	150
Phosphorus	7	30	30
Pottassium	490	520	520

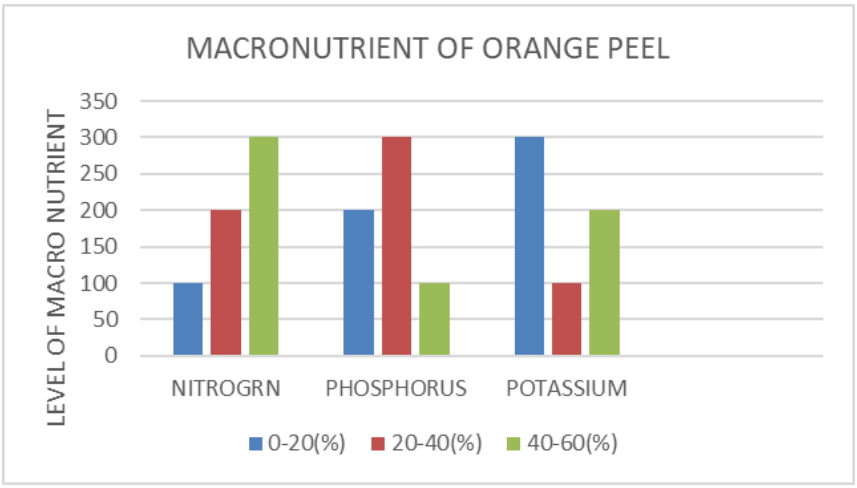

Fig 3: Vegetable Waste Vermicompost.

Table 4: Macronutrients in Vegetable Waste Vermicompost.

Nutrients /No of Days	0-30 Days (%)	30-60days (%)	60-90days (%)
Nitrogen	80	95	130
Phosphorus	7	30	35
Pottassium	250	450	550

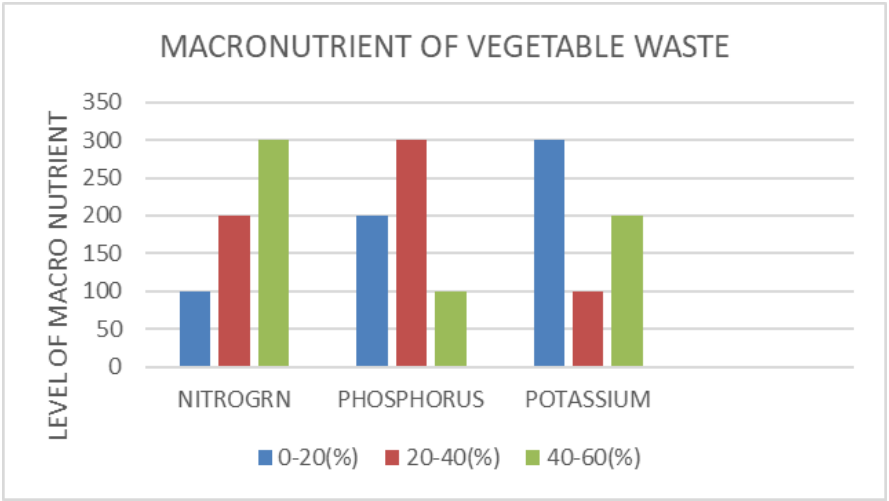

Fig 4:

Vermi Compose Added to Tomato Plants

Vermi Compose Added to Bringal Plants

Vermi Compose Added to Chilly Plants

Table 5: N P K Conten of Soil After the Plant Growth.

S.No	Onion Peel	Orange Peel	Vegetable Waste
N2	90	75	95
P2	30	30	30
K2	450	450	450

Discussion

Earthworm processed in material 'casts' contain several soil nutrients in forms which are easily available to plants (Taylor *et al.*,2003). Earthworms rapidly convert the waste into humus-like substances with finer structure than thermophilic composts but possessing a greater and more diverse micro bioactivity (Elvira *et al.,* 1996).

In the vermicompost of different organic materials of Nitrogen content was very high in sample-A (onion peel), sample-B (orange peel), sample-C (vegetable waste) and sample-D (control). In the present study, the effect of vermiwash was observed on the plants of tomato, brinjal and chilli it was found that the results obtained were almost similar to the results of vermicompost**. (**Ansari, 2008**).** Among the macro and micronutrients are sample- A (onion peel), sample-B (orange peel), sample-C (vegetable waste), sample-D (control sample). The ph. level of orange peel vermicompost is the highest value of the samples. It was observed that during growth of plants. (Ansari and kumar *et al.,* 2010).

Conclusion

The utility of NPK contents can differ with the plants it is added, but the uniform utility of all macro nutrients can be used by the all three types of plants. Vermicompost is a magic thing for the essential macro and micro nutrients for the soil. The decomposition through agricultural waste might be an alternative method. The utilization of vermicompost to plants to increase to plants increase the growth and productivity. Vermicompost is a unconventional biofertilizer than any other thing. It has the capacity to change the poor soil into best fertile soil. Vermicompost is the only remedy for polluted soil

Acknowledge

We would like to thank full for The Principal Dr. S. Thirumal Murugan, Adhiyaman Arts and science college for women, Uthangarai, Tamilnadu, The secretary Dr. J. M. Shoba,Adhiyaman Arts and Science College for women, Uthangarai, Tamilnadu, support provided throughout the Research.

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