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Nutrient Analysis of *Polyalthia longifolia* (leaf litter) degraded by *Eudrilus eugeniae*

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Abstract: In modern times due to industrialization and simultaneous population explosion, Pollution has suddenly come to the forefront. Infact, waste can be converted into useful products using suitable recycling techniques. The recycling of waste through vermitechnology reduces the problem of non-utilization of agro wastes. Nutrients present in vermicompost are readily available and the increase in earthworm population on the application of vermicompost and mulching leads to easy transfer of nutrients to the plants providing synchrony in ecosystem. The present study was carried out to find the levels of macronutrients namely nitrogen, phosphorous and micronutrients namely Iron, copper in the leaf wastes during vermicomposting at different time intervals degraded by *Eudrilus eugeniae* .The level of both macro and micronutrients present in the vermicompost was found to be significantly increased on the 25th day of composting by *Eudrilus eugeniae.*
Keywords: *Eudrilus eugeniae*, *Polyalthia longifolia*, Macro and Micro nutrients.

INTRODUCTION

All human activities generate some kind of by-products or wastes, which are apparently of no use to us and have to be discarded. Solid waste management is essential to maintain healthy environment. The common solid wastes produced by towns and cities are mainly the organic wastes. They include kitchen wastes, vegetable market waste, sewage sludge, animal excreta, weeds, coir waste, leaf filter, paper and pulp waste, agricultural residues, feed and fodder wastes and aquatic biomass [1].

The Green Revolution in India, which was heralded in the 1960's, was a mixed blessing. Ambitious use of agrochemicals boosted the food production but also destroyed the agricultural ecosystem[2]. Of late, Indian farmers and agricultural scientists have realized this and are anxious to find alternative's perhaps, a non chemical agriculture and have been reviewed their age- old traditional techniques of nature farming[3].

Earthworm act in the soil as aerator, grinders, crushers, chemical degraders and biological stimulators. They secrete enzyme namely protease, lipase, amylases, cellulases and chitinase, which bring about rapid biochemical conversion of cellulosic and the proteinaceous material in the variety of organism wastes. Earthworms create aerobic condition in waste materials, inhibiting the aeration of microorganisms, which cause

foul odour. Further, earthworms release coelomic fluids in the decaying waste biomass, which have anti-bacterial properties that kill pathogen[4].

Earthworm form a major component in the soil biota and they together with a larger number of other organisms constitute the soil community. The chief source of food to the soil biota is litter contributed by plants. Although the dead plant tissues constitute to the bulk of the food ingested by earthworms, living organisms, fungi, micro and mesofauna and their dead tissue are also ingested as an important part of the diet.

All species of earthworms are not suitable for vermicomposting. Species selection should be done according to the requirement. The worms selected should be disease resistant, adaptable to climate, compatible and should be easily culturable. They should have the ability to thrive on abundant, cheap and organic food which is available and should be efficient converters of biowastes.

Vermitechnology is the process of converting organic wastes, by earthworms into valuable, organic fertilizer. It is very cost effective, eco-friendly, cheap and easy method of recycling biodegradable wastes using selected species of earthworms[5]. During vermicomposting not only the bad smell is eliminated but also reduction of many pathogenic organism (example: *Salmonella, serratia marcessens, and E.coli in faeces*) takes place. Earthworms increase the population of certain beneficial microorganism (example: *Actinomycetes)* in the vermicompost. Thus, earthworms play an important role as a versatile natural bioreactors, effectively harnessing the beneficial soil-microflora and destroying pathogenic microbes, apart from converting organic wastes into useful organic manure[6].

MATERIALS AND METHODS

Collection and predecomposition of leaf litter

The leaf litters were collected from Karunya university campus, Coimbatore, Tamilnadu. The collected leaf litters were chopped into small pieces and allowed to partial decomposition for 20 days. Then the waste was then mixed with cow dung in 3:1 ratio.

Collection and culturing of earthworm

The exotic earthworms ***Eudrilus eugeniae*** were collected from TNAU, Coimbatore and cultured in laboratory for proper growth and survival.

Vermicomposting of leaf litters

Rectangular shaped vermicompost tanks were constructed and the floor of the tanks was covered with a lattice of wood strips to provide drainage. Totally 2 pits were maintained for the purpose. The pit 1 was maintained as a control without the earthworms while the pit 2 was maintained for the experimental purpose. In the second pit 300 kg of leaf waste was taken along with the earthworm ***Eudrilus eugeniae*** which was released on the surface at the rate of 60 worms per square feet. Care should be taken to avoid light and rainfall. The compost sample was taken on the 25^{th} day of composting for analysis of macro and micro nutrients parameters.

RESULT AND DISCUSSION

Earthworms improve the aeration of soil by their burrowing activity. Earthworm activity increased the porosity of soil. Earthworms improve the nature of the soil by breaking up the organic matter and increasing the amount of nitrogen made available to plants either by excretion or decay of earthworm corpses. The production of cast by earthworms depends on the season and type of vegetation. The casting contains as much as 5 times more nitrate nitrogen, 14 times more calcium, 3 times more magnesium, 11 times more potassium than that of 15cm top soil. Kale (1998) reported that the biodegradable organic wastes can be converted into vermicompost. When earthworms feed on organic wastes it undergoes physical and chemical breakdown during the process of ingestion and digestion. About 5-10 percent of the ingested material is absorbed into the tissue for their growth and metabolic activity and rest is excreted as cast. The cast is mixed with mucus secretion of gut wall and of

microbes. These add to structural stability of the cast which is used as vermicompost. The decomposition process continues even after the release of the cast by the establishment of microorganisms.

Hence the following investigations namely estimation of macro and micro nutrients, were performed to find out the quality of vermicompost. The results of the present study are discussed under the following headings.

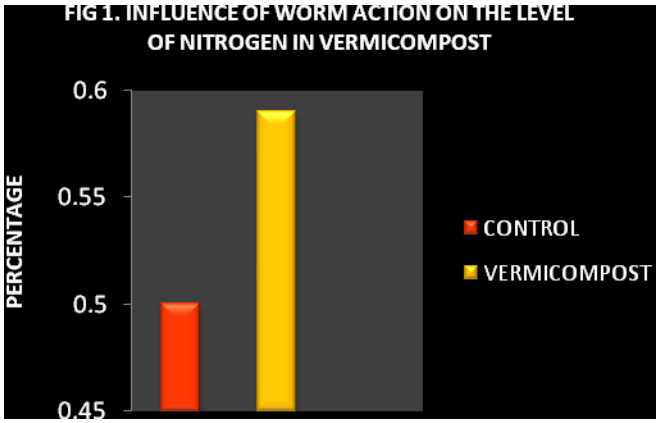
Macronutrients:

Nitrogen

The Nitrogen content present in *polyalthia longifolia* waste composed by *Eudrilus eugeniae* is represented in Table-1 and Figure-1.

Table-1: Influence of worm action on the level of Nitrogen in vermicompost

Waste	Species	Level Of Nitrogen Present	
Polyalthia longifolia	*Eudrilus eugeniae*	Control	Vermicompost
		0.50	0.59



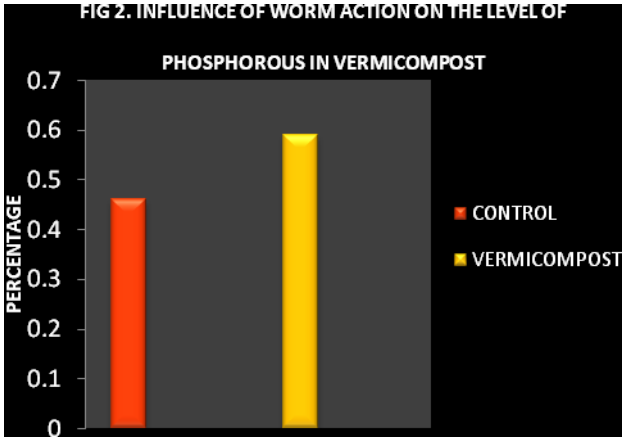
In the present study the nitrogen content in vermicompost was found to be increased on the 25th day of composting and the variation of control in percentage is 18%. Increase in nitrogen content is due to the fact that earthworms enhanced the nitrogen cycle which attributed to increased levels of nitrogen in vermicompost[7]. Tripathi and Bhardwaj (2004) reported that increase in nitrogen content was found in the final product in the form of mucus, nitrogenous excretory substances, growth stimulating hormones and enzymes from earthworms.

Phosphorous

The Phosphorous content present in *Polyalthia longifolia* waste composed by *Eudrilus eugeniae* is represented in Table-2 and Figure-2.

Table-2: Level of Phosphorous present in vermicompost

WASTE	SPECIES	LEVEL OF PHOSPHOROUS PRESENT	
Polyalthia longifolia	*Eudrilus eugeniae*	Control	Vermicompost
		0.46	0.59



The above Table-2 and Figure -2 illustrates the level of high phosphorous content present in vermicompost when compare to control. The total phosphorous present in the vermicompost is 28.26% higher than in control. [8] Parthasarathi and Ranganathan (2000) observed that leaf litter was found to contain more available phosphorous after ingestion by earthworms, which may be due to the breakdown of the leaf material by worms.

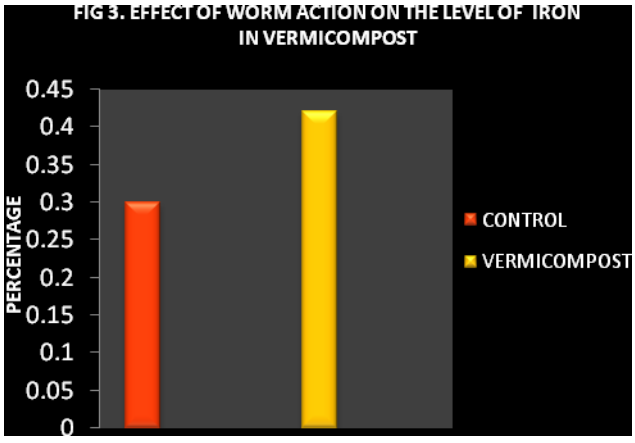
Micro Nutrients:

Iron

Table-3 and Figure-3 depicts the content of Iron in vermicompost.

Table-3: Effect of worm action on the level of Iron in vermicompost

WASTE	SPECIES	LEVEL OF IRON PRESENT	
Polyalthia longifolia	*Eudrilus eugeniae*	Control	Vermicompost
		0.30	0.42



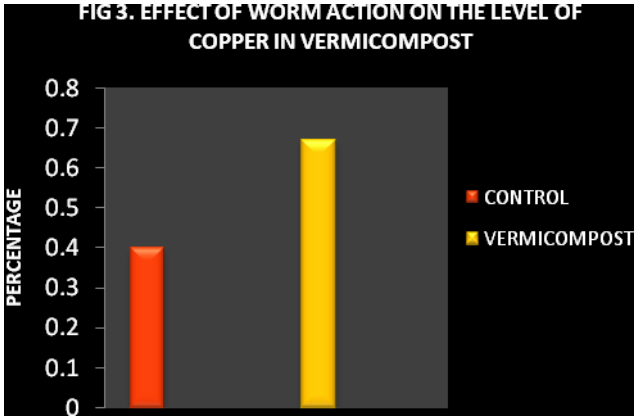
It is evident from the results of Table 3 and Figure 3 that the iron content in vermicompost increased by 40% on the 25th day of composting. The presence of enzymes and co-factors in the earthworm gut increased the iron content in the vermicompost. [9] Our results are in accordance with Sivakumar *et al*., (2005) who reported the presence of iron content in vermicompost.

Copper

Table-4 and Figure-4 depicts the copper content in vermicompost.

Table-4: Influence of worm action on the Copper level in vermicompost

WASTE	SPECIES	LEVEL OF COPPER PRESENT	
Polyalthia longifolia	*Eudrilus eugeniae*	Control	Vermicompost
		0.40	0.67



Higher content of copper was seen in vermicompost when compared to control. The increase was 67.5%. Increase of copper content in vermicompost might be due to the increased content of several Cu containing oxidizing enzymes. [10] Our results are in accordance with Suthar (2007) who reported that elevated levels of copper in vermicompost.

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