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Vermicompost from Kitchen Waste and Paper Waste by *Eudrilus eugeniae,* Nutrient Analysis and Efficiency on *Alternanthera sessilis* Plant Growth

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In India, a significant amount of paper and kitchen waste is produced, much of which is either burned, left outside, or landfilled, creating a significant challenge for its safe disposal. The Eudrilus eugeniae (Kinberg) earthworms can be used to convert all kitchen and paper waste into extremely useful, nutrient-rich vermicompost. The vermicompost contributes significantly to the growth and yield of various field crops, vegetables, flower and fruit crops. The use of organic residuals lowers production costs while eliminating the requirement for waste disposal and incineration. The present research was carried out to find out the potential vermicompost using kitchen and paper waste to compost on the Eudrilus eugeniae earthworm as it effectively decomposes waste. Vermicompost has been analysed to physicochemical parameters like pH, and the level of macronutrient, and

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micronutrient content namely nitrogen, phosphorous, potassium, iron, copper, manganese and zinc analyses between the 30th and 60th day of control (raw soil), kitchen and paper waste vermicomposting. The vegetable plant Alternanthera sessilis, commonly known as sessile joy weed or Ponnanganni, has been used to test and investigate the effectiveness of vermicompost. The plant growth parameters, especially root length, shoot length, and number of leaves has been studying. Finally, a comparison was made with plants growing on the 30th &60th days of kitchen waste vermicompost and the 30th & 60th days of paper waste vermicomposting. In final results, the plant obtains maximum growth in kitchen waste vermicompost as a result of Alternanthera sessilis (sessile Joyweed) growth on the 30th and 60th days. The kitchen waste vermicompost contains a higher amount of NPK content than the control and paper waste vermicomposts. Consequently, the Alternanthera sessilis plants thrived on the kitchen wastes.

Keywords: Significant; Eudrilus eugeniae; Alternanthera sessilis; kitchen waste; paper waste; vermicompost; biofertilizer.

1. INTRODUCTION

“In recent years, the disposal of organic wastes from home, agricultural, and industrial sources have produced significant environmental and economic concerns, and many various systems to handle this problem have been developed. Vermicomposting is generally defined as the solid phase decomposition of organic residues in the aerobic environment by exploiting the optimum biological activity of earthworms and microorganisms” [1]. “The growth of earthworms in organic wastes has been termed vermiculture and the processing of organic wastes by earthworms is known as vermicomposting [2]. The total richness of earthworms worldwide is probably well over 8,000 species” [3]. “But few species are used in the process of vermicomposting. The potential of earthworms in soil processing due to their burrowing nature and composting of organic matter has been realized and simple appropriate vermiculture biotechnology has been developed which may solve the problems of waste processing and management to a large extent” [4]. “*Eudrilus eugeniae* (Kinberg) is the commonly type of earthworms used for vermicomposting in tropical and sub-tropical countries” [5]. “The earthworm species, *E. eugeniae* is indigenous to Africa but has also been bred in the USA, Canada, Europe and Asia, where it is commonly called the African nightcrawler, to be used as fish bait” [6]. “Applied use of earthworms in the breakdown of a wide range of organic residues, including sewage sludge, animal wastes, crop residues, industryial refuse, Kitchen waste and paper waste to Produce vermicompost” [7,8,9]. "Vermicomposting process shows great potential in the degradation of wastes converting some portion of waste into earthworm biomass and respiration product and expelling the remaining wastes as earthworm cast” [10]. “The excreted vermicast is reported to contain high amounts of mineral nutrients, vitamins, plant growth hormones, proteins and enzymes” [11]. “Vermicomposting is a decomposition process involving the joint action of earthworms and microorganisms under which earthworms recycles the organic waste residues and significantly increases the amount of N, P and K, Ca, Mg, useful microorganisms, (bacteria, fungi, actinomycetes and protozoa) hormones, enzymes and vitamins and certain micronutrients needed for plant growth” [12,13]. The present research aimed to define the length and weight growth parameters of the *Eudrilus eugeniae* worm in kitchen and paper waste. Estimation of macro and micro nutrients in two different vermicomposts. Finally, analyse and differentiate the effect of vermicompost on the growth of the *Alternanthera sessilis* (Sessile Joy weed - Ponnanganni) plant.

2. MATERIALS AND METHODS

The present study was carried out in Sarah Tucker College Campus, located at an altitude 825’ North, longitude 77º10’ East and 77º35’ East about 8km from Tirunelveli.

The waste paper was collected and. the procured paper was shredded before using a paper shredder. The kitchen waste was procured from the Hostel, Sarah Tucker College, Tirunelveli. The procured kitchen waste was sun-dried and cut into small pieces before being introduced into the Vermi bed. Cow dung was obtained from a local cowshed and sun-dried.

For composting, the African species of earthworms i.e., *Eudrilus eugeniae* were

collected from the Agricultural College and Research Centre, Killikulam, Tuticorin. The earthworm species *Eudrilus eugeniae* was found to be a highly efficient species for culture maintenance in India.

Two sets of Vermicompost pits were used in this present study. clean-up and preparation of the previously built vermiculture pits. There are two Vermi beds, 24×89 cm and 24×86cm in size and made with hollow blocks. We have cleaned each Vermi bed and started to gather substrates.

2.1 Substrate Application and Composting Experiment

After some days of gathering, we put the substrates to both Vermi beds on July 10, 2023.We put a mixture of red clay soil 250kg and 10kg of kitchen waste in the first Vermi bed while in the second bed; we put a mixture of red clay soil 250kg and 10kg of paper waste. The succeeding application made use of mixed and different substrates. Before putting the substrate, we made sure that the materials were cut or broken into smaller pieces. Finer materials could easily decompose (partial decomposition). We also put the cow dung, cattle dung, and curd together well for the worms to easily digest them. For the control, no food waste was added. We have moistened the materials and covered the Vermi beds with roof and tarpaulin cover to close the pit. The substrates were kept in the beds for one day before we put the Vermi worms. It took 24 hours to complete anaerobic decomposition and only then that they are ready for worm consumption. On the second day of July 11, 180 worms were introduced on both vermi pits. Every day, the vermi pits were monitored and covered with sheeting. For 60 days moisture the vermicompost by spraying the cow dung and curd. until the finely granular vermicompost was ready, this entire setup was kept up for 60 days. During the composting process, the material was analysed for different physio-chemical attributes such as pH, total Nitrogen, available Phosphorus, exchangeable Potassium, copper, Iron, zinc, and manganese. The worm's height and weight are measured weekly once. During investigation, the samples were examined at periodic intervals after 30thand 60thdays of vermicomposting.

2.2 Worm Growth Biomass

Earthworms were taken out from the feedstock mixtures and cleaned with water, to remove the substrate. Length and Weight of earthworms were estimated at a respective time interval (one week once). In the feedstock mixture, cocoon and clitellum growth rates were also calculated.

2.3 Collection and Nutrition Analysis of Samples

Vermicomposting was done for 60 days and samples were collected 30th and 60th day of composting from each pit. The samples were analyzed for pH, Macronutrients, and Micronutrients at Tamilnadu Government Agricultural Department (Soil Test Lab), in Palayamkottai, Tirunelveli.

2.4 Collection of *Alternanthera sessilis* Seed

The *Alternanthera sessilis* seed was collected from the nursing garden in Tirunelveli. It is used to study the effect of vermicompost on plant growth.

Table 1. Material for the preparation of vermicompost during study period

S.NO	Parameters	Data	
		Kitchen waste (Bed 1)	Paper waste (Bed 2)
1.	Total cow dung used	15Kg	15 Kg
2.	Total curd used	10L	10L
3.	Total kitchen waste and Paper waste used	80Kg	80Kg
4.	Initial no. of earthworm used	180	180
5.	No. of earthworm at the time of harvest	190	300
6.	No. of preparatory days for the compost	60 days	60 days

Fig. 1. A comparison of the growth of *Alternanthera sessilis* treated with kitchen and paper waste vermicompost on 30th and 60th day

2.5 Study on the Effect of Vermicompost on the Growth of *Alternanthera sessilis* (Sessile Joyweed - Ponnanganni)

The seeds of *Alternanthera sessilis* were grown in five different pots: T1, T2, T3, T4, and T5.

T1- Control (without vermicompost),
T2- kitchen waste vermicompost (30 days); T3- paper waste vermicompost (30 days)
T4- kitchen waste vermicompost (60 days); T5- paper waste vermicompost (60 days).

2.6 The Following Parameters were Observed on the 30th day of Planting

2.6.1 Root length, 2. shoot length, and 3. leaf count

The T1 pot was filled with red soil, and the remaining four pots were filled with 30th and 60th day of kitchen and paper waste vermicompost. The seed of *Alternanthera sessilis* was plotted in each pot. These pots were under observation for 30 days to observe the growth of *Alternanthera sessilis.* For 30 days, the water was sprinkled regularly to maintain the moisture content in each pot. After treatment, stem cuttings were carefully removed from the soil without any damage and washed in running water to remove the adhering soil particles. The length of the root, shoot, and leaf measurements were taken.

1. **Root length**: The length of the root was measured from the collar region to the growing tip of the root and expressed in cm.
2. **Shoot length:** The length of the shoot was measured from the collar region up to the tip of the shoot and expressed in cm.
3. **Number of leaves or needles:** The total number of leaves per pot in each plant was counted and expressed as the number of leaves per plant.

3. RESULTS AND DISCUSSION

A fine, granular, odourless, black peat-like structured compost was obtained after sixty days in both treatments, which marked the potentiality and suitability of all the substrates for vermicomposting purposes. Thus, the collected samples were analysed for nutrient content. For soil nutrient analysis, various parameters such as pH, moisture content, total organic content, macronutrients, micronutrients, and calcium carbonate were analysed by different chemical tests to determine the nutrient composition of untreated soil samples and vermicompost samples of different wastes. The African Night Crawler *(Eudrilus eugeniae)* is a composting earthworm that is efficient at converting waste into vermicompost. This study determined if there are significant differences in the vermicompost produced using paper waste as substrate compared with kitchen waste. Results of the average method revealed significant differences in the weight of vermicompost, the change in weight of African night crawlers (ANC), and the number of earthworms. Hence, in the following study, physicochemical parameters, enzymes, macronutrients, and micronutrients in vermicompost were analysed to determine the quality of vermicompost after 30 and 60 days of the vermicomposting process. The control taken for analysis is the raw waste. The effect of vermicompost on the growth parameters of the *Alternanthera sessilis* plant was selected for the present study.

Cow dung: In this research, cow dung was used as a basic food material in each compost bin. Fifteen-day-old partially decomposed cow dung was used in this research, as fresh cow dung could be harmful to earthworms due to the heating process.

Cattle Dung: Cattle dung is also an excellent food for earthworms in vermicomposting. Cattle dung is rich in nutrients and is suitable for plant growth.

Curd: Curd is used to provide sufficient nitrogen, phosphorous, and potash to the vermicompost. It gives good micronutrients to vermicompost. Curd is a natural organic fertilizer, and when it is added to the soil, it fertilizes plants and improves growth. The probiotics in curd work together to produce humic acid, which is a natural pest repellent.

3.1 The Length and Weight Growth Parameters of *Eudrilus eugeniae* Worm in Kitchen Waste and Paper Waste

3.1.1 Comparison of weight in African night crawler

The feeding items that were given to the African night crawler had a substantial impact on their weight change. The average weight and length of the worm depicted in Figs 2 & 3 and Tables 2 & 3. The result based on the highest change in weight was observed for those fed with Paper waste while the lowest was for those feds with mixed Kitchen wastes.

3.1.2 Earthworm production rate

The production rate of worms is used as a biological indicator for monitoring vermicomposting operations. During the experimental period of 60 days, worms grew well in paper waste vermicompost compared to kitchen waste vermicompost and no mortality was observed in any one. Changes in the population and the mass of worms in both vermi pit during time. “The distinct weight losses between these experimental units were possibly due to the presence of cow dung, which could catalyse the microbial degradation of waste. Such activities encourage the release of CO2 via the mineralization process of organic matter. The weight losses in treatment pots with earthworms were higher than those in the control (without worms). This indicates that the presence of earthworms in the system demonstrated the enhancement of a biological process, leading to higher weight loss compared to the setups without worms. Also, the worms’ physical activities like blending and mixing of waste increased the surface area exposed to microorganisms, hence creating more favourable conditions for microbial activities and faster degradation” [14]. Swift et al. [15] stated that “the variations in degree of decomposition and mineralization can be attributed to the substrate quality and the composition of the decomposer community”.

3.2 The Macro and Micro Nutrient Estimation of Kitchen Waste and Paper Waste Vermicompost

3.2.1 Assay of physicochemical parameters in vermicompost

The analysis of various physicochemical parameters plays a key role in determining the quality of vermicompost obtained from kitchen waste and paper waste. decomposed by *Eudrilus eugeniae.* A change in colour and texture of the substrate in each pit was observed periodically and noted until it turned a dark brown-black colour and a moist, homogenously dissipated, granulated form.The weight loss percentage of organic substrate during vermicomposting was estimated by finding the difference between the final weight of the organic substrate and the initial weight of the organic substrate.

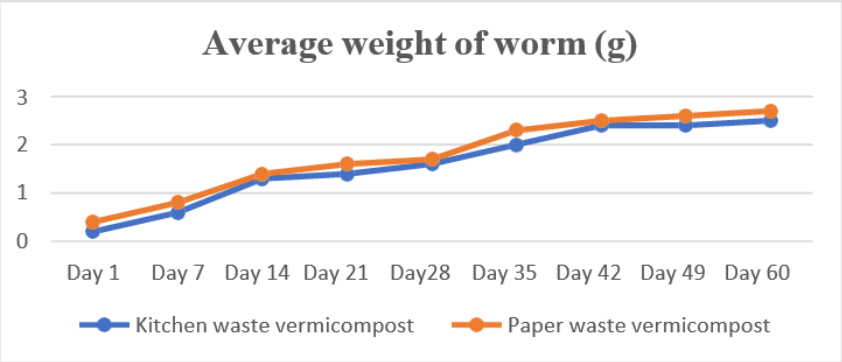

Fig. 2. Graphical representation of Average weight of worm

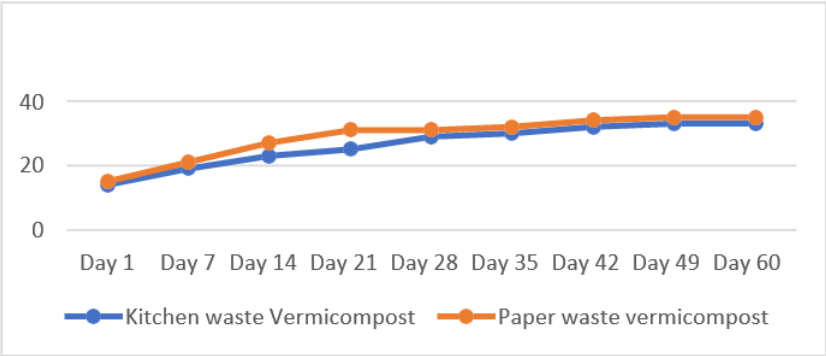

Fig. 3. Graphical representation of average length of worm

Table 2. Composting period on earthworm weight

Types of waste	Average weight of worm(gm)								
	1 Day	7 Day	14 Day	21 Day	28 Day	35 Day	42 Day	49 Day	60 Day
Kitchen waste	0.2	0.6	1.3	1.4	1.6	2.0	2.4	2.4	2.4
Paper waste	0.4	0.8	1.4	1.6	1.7	2.3	2.5	2.6	2.6

3.2.2 pH

The level of pH during the decomposition of waste composted by *Eudrilus eugeniae* is depicted in Fig. 4. On the 30th day of vermi, the level of pH increased in kitchen waste vermicompost (8.0) when compared to control and paper waste vermicompost (6.5 and 7.3). On the 60th day of vermi, the level of pH increased in kitchen waste vermicompost (8.1) when compared to control and paper waste vermicompost. (6.5 and 8.0). The decrease in pH in vermicompost might be due to the participation of microbes in the decomposition during vermicomposting. Production of CO2 and organic acids by microbial decomposition during vermicomposting was the underlying factor for the pH decline. However, the present results showed that earthworms are sensitive to changes in pH and prefer conditions of neutral reaction.

3.3 Macronutrients and Micronutrients Present in Vermicompost

3.3.1 Macronutrients

3.3.1.1 Nitrogen

The nitrogen content present in control, kitchen waste, and paper waste composted by *Eudrilus eugeniae* is represented in Fig. 5. On the 30th day of vermi, the level of nitrogen increased in kitchen waste vermicompost (137) when compared to control and paper waste vermicompost (101 and 87). On the 60th day of vermi, the level of nitrogen was increased in kitchen waste vermicompost (199) when compared to control and paper waste vermicompost. (101 and 84). The increase in nitrogen content in vermicompost is due to the fact that earthworms enhanced the nitrogen cycle, which is attributed to the increased levels of nitrogen in vermicompost. The losses of organic carbon might be responsible for nitrogen addition in the form of mucus, nitrogenous excretory substances, growth stimulatory hormones, and enzymes from the gut of earthworms.

3.3.1.2 Phosphorous

The Fig. 6 illustrates the phosphorous content present in vermicompost. On the 30th day of vermi, the level of phosphorous increased in kitchen waste vermicompost and paper waste vermicompost (17 and 17) when compared to control (4). On the 60th day of vermi, the level of phosphorus increased in kitchen waste vermicompost (23) when compared to control and paper waste vermicompost. (4 and 7). The enhanced phosphorous level in vermicompost is due to the mineralization of phosphorous during vermicomposting. The release of phosphorous in its available form is performed partly by earthworm gut phosphatases, and further release of phosphorous might be attributed to the phosphorous-solubilizing microorganisms present in vermicompost.

3.3.1.3 Potassium

The Fig. 7 depicts the potassium content present in each vermicompost. On the 30th day of vermi, the level of potassium increased in kitchen waste vermicompost (314), when compared to control and paper waste vermicompost (217 and 309). On the 60th day of vermi, the level of potassium increased in kitchen waste vermicompost (467) when compared to control and paper waste vermicompost. (217 and 278). The increase in potassium content in vermicompost might be due to changes in the distribution of potassium between non-exchangeable and exchangeable forms. The earthworm-processed waste material contains a high concentration of exchangeable potassium due to enhanced microbial activity during the vermicomposting process, which consequently enhanced the rate of mineralization.

Table 3. Composting period on earthworm length

Types of waste	Average length of worm(cm)								
	1 Day	7 Day	14 Day	21 Day	28 Day	35 Day	42 Day	49 Day	60 Day
Kitchen waste	14	19	23	29	25	30	32	33	33
Paper waste	15	21	27	31	31	32	34	35	35

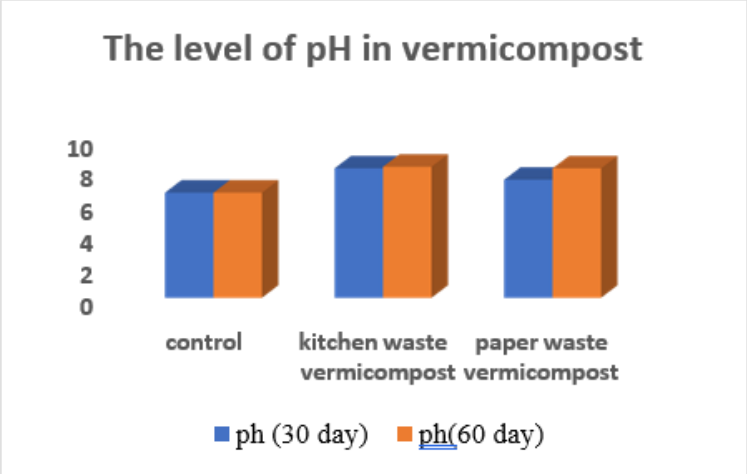

Fig. 4. Bar diagram represents the level of pH in vermicompost

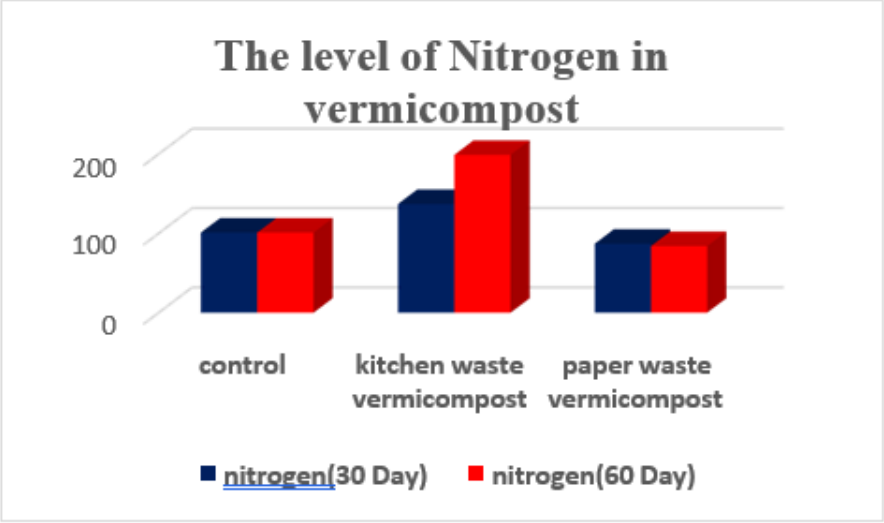

Fig. 5. Bar diagram represents the level of Nitrogen in vermicompost

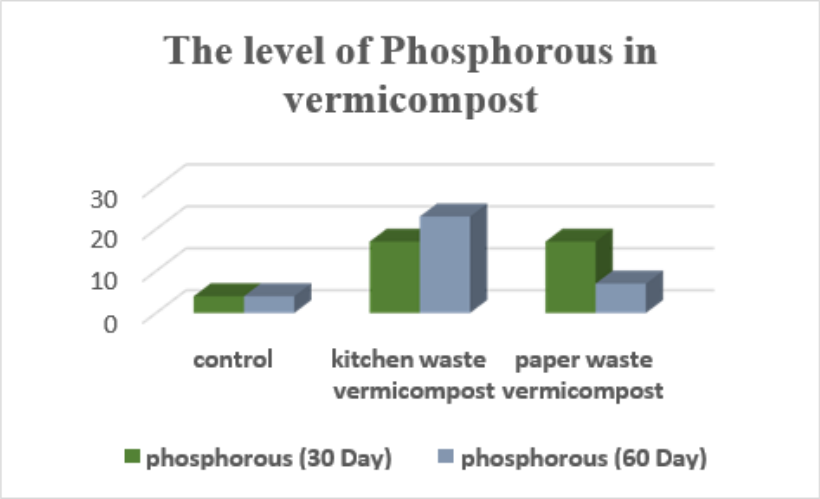

Fig. 6. Bar diagram represents the level of Phosphorous in vermicompost

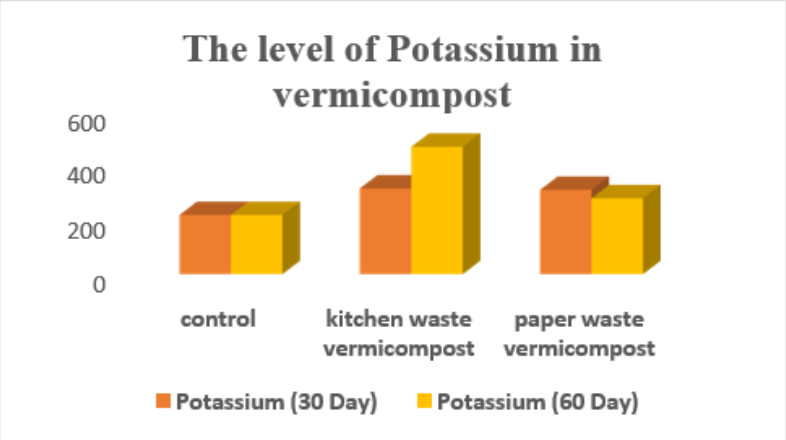

Fig. 7. Bar diagram represents the level of Potassium in vermicompost

3.4 Micronutrients

3.4.1 Iron

The iron content level in each vermicompost is shown in Fig. 8. On the 30th day of vermi. the level of iron increased in paper waste vermicompost (99.99) when compared to control and kitchen waste vermicompost (27.44 and 97.56). On the 60th day of vermi, the level of iron increased in kitchen waste vermicompost (9.04) when compared to control and paper waste vermicompost. (27.44 and 59.30). The presence of enzymes and co-factors in the earthworm gut increased the iron content of the vermicompost.

3.4.2 Copper

The Fig. 9 depicts the copper content in each vermicompost. On the 30th day of vermi, the level of copper increased in kitchen waste vermicompost (3.69) when compared to control and paper waste vermicompost (2.53 and 3.29). On the 60th day of vermi, the level of copper increased in control (2.53) when compared to kitchen waste vermicompost and paper waste vermicompost. (1.24 and 1.09). The increase in copper content in vermicompost might be due to the increased content of several Cu-containing oxidising enzymes. The copper was found to be increased in worm casts.

3.4.3 Manganese

The Fig. 10 depicted the manganese content in each vermicompost. On the 30th day of vermi, the level of manganese was increased in paper waste vermicompost (53.58) when compared to control and kitchen waste vermicompost (36.78

and 42.30). On the 60th day of vermi, the level of manganese increased in control (36.78) when compared to kitchen waste vermicompost and paper waste vermicompost. (35.74 and 13.49).

3.4.4 Zinc

The zinc content of vermicompost is depicted in Fig. 11. On the 30th day of vermi, the level of zinc increased in kitchen waste vermicompost (4.95) when compared to control and paper waste vermicompost (4.12 and 3.45). On the 60th day of vermi, the level of zinc increased in control (4.12) when compared to kitchen waste vermicompost and paper waste vermicompost. (0.01 and 2.58).

3.5 Comparison of Nutrient Composition in Vermicompost

The vermicompost from different substrates was found to be rich in N, P, and K contents. However, the nutritional composition of vermicompost varied with the substrate used. Kitchen waste material is characterised by high pH values and organic carbon compared to paper waste. However, other nutrients, such as total nitrogen available, phosphorus, and exchangeable potassium, were found in very trace amounts. The process of vermicomposting significantly modified the physical and chemical properties of paper waste and kitchen waste material, making it an important tool for organic farming. If compared to compost created from paper waste, the vermicompost made from kitchen waste showed a higher value of macronutrients. Manaf et al. [16] suggested that the best pH condition for the growth of the worm is near-neutral. Munroe [17] reported that earthworms absorb water and breathe through their skin. They are sensitive to the pH value of the substrate. pH value is one of the most important factors affecting the survival of worms [18].

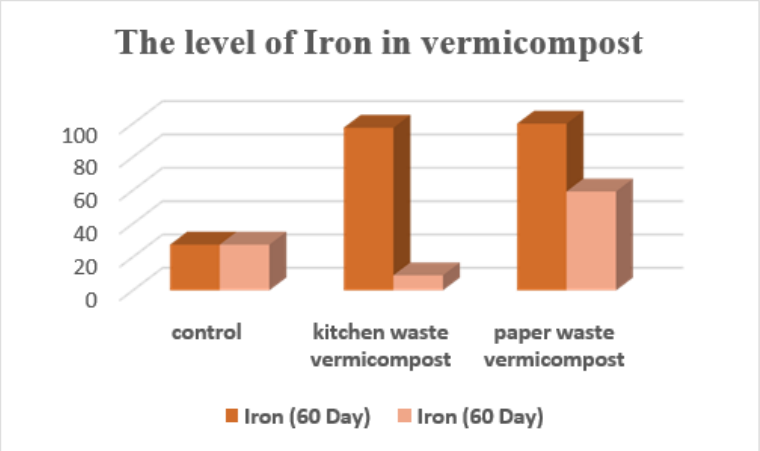

Fig. 8. Bar diagram represents the level of Iron in vermicompost

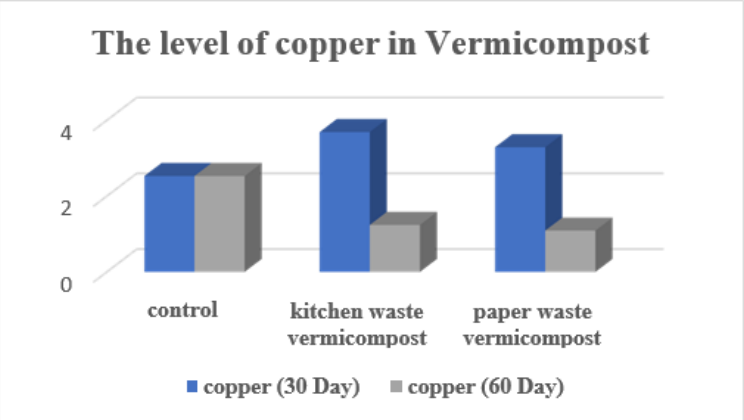

Fig. 9. Bar diagram represents the level of copper in vermicompost

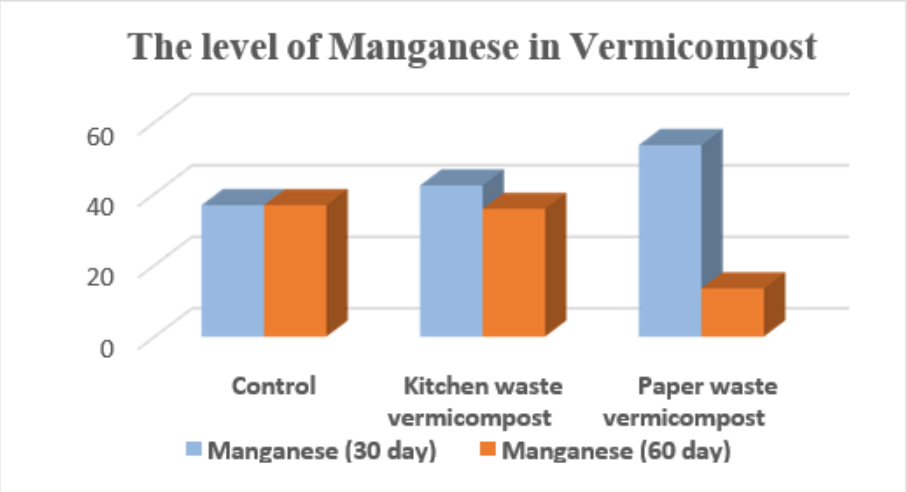

Fig. 10. Bar diagram represents the level of Manganese in vermicompost

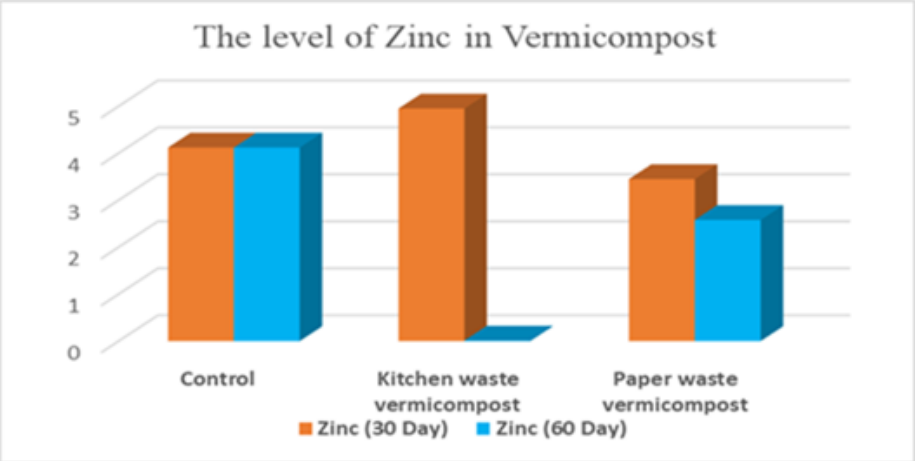

Fig. 11. Bar diagram represents the level of Zinc in vermicompost

Table 4. Soil, Kitchen waste and Paper waste nutrients parameters

	Soil		Kitchen waste		Paper waste	
Parameters						
	Day 30	**Day 60**	**Day 30**	**Day 60**	**Day 30**	**Day 60**
PH	6.5	6.5	8.0	8.1	7.3	8.0
Calcium carbonate	-	-	-	-	-	Medium
Salt content	0.25	0.25	0.55	0.65	0.58	0.59
Macronutrients						
Organic mattter	0.6	0.6	1.62	1.17	1.29	0.93
Nitrogen	101	101	137	199	87	84
Phosphorus	4	4	17	23	17	7
Potassium	217	217	314	467	309	278
Micronutrients						
Iron	27.44	27.44	97.56	9.04	99.99	59.30
Manganese	36.78	36.78	42.30	35.74	53.58	13.49
Zinc	4.12	4.12	4.95	0.01	3.45	2.58
Copper	2.53	2.53	3.69	1.24	3.29	1.09

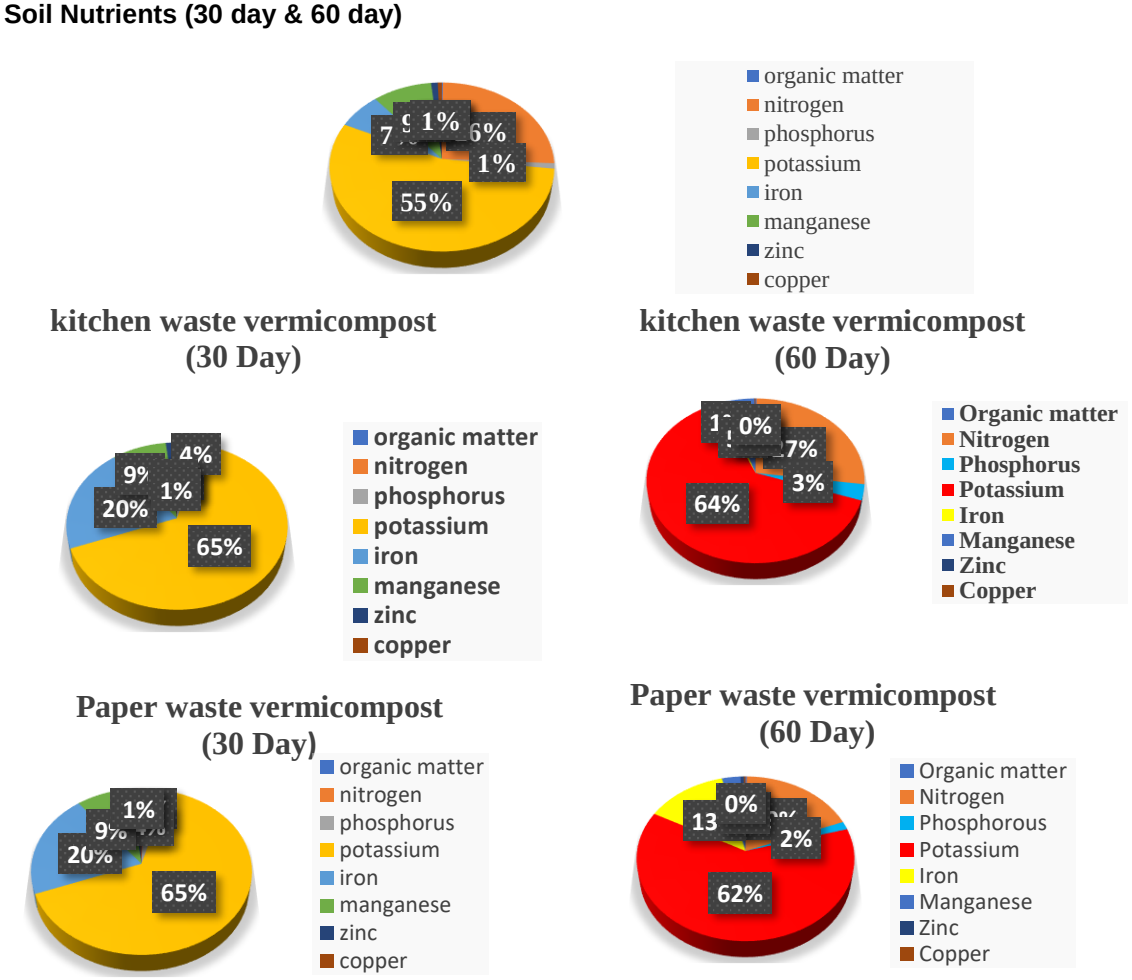

Fig. 12. Pie diagram represents the Nutrients on Soil, Kitchen and Paper waste vermicompost on 30th&60th day

3.6 To Analyse and Differentiate the Effect of Vermicompost on the Growth of *Alternanthera sessilis (Sessile* Joy weed, Ponnanganni)

3.6.1 The effect of vermicompost on growth *Alternanthera sessilis* (Sessile Joyweed, Ponnanganni)

The ability of compost to promote plant development serves as the ultimate indicator of its stability. The trials conducted on the Joyweed plant showed that kitchen waste vermicompost enhanced all the growth parameters compared to paper waste vermicompost. It points to the fact that the kitchen waste vermicompost had been composted and the unavailable nutrients present were made available to the plant easily, which was not the case in paper waste vermicompost.

Systematic classification:

- **Kingdom:** Plantae
- **Order:** Caryophyllales
- **Family:** Amaranthaceous
- **Genus:** Alternanthera
- **Species:** *A. sessilis*

3.7 Morphology of *Alternanthera sessilis*

Alternanthera sessilis is a flowering plant that is also known as joyweed and dwarf copperleaf. It is cultivated as a vegetable all over the world. The plant is found throughout the world's tropical and subtropical climates. This is a perennial herb with prostrate stems that rarely rise and often root at the nodes. The leaves are obovate to broadly elliptic, with a few linear lanceolate segments. Sessile spikes, bracts, and bracteoles

Table 5. Effect of application of composted kitchen waste and Paper waste on growth characters of Joyweed

Treatment	Shoot length (cm)	Root length (cm)	No. of leaves
T1	14	1	100
T2	19	3	200
T3	17	2	150
T4	24	5	300
T5	22	4	250

with white flowers. It flowers in the wild from December to March.

The inclusion of cow dung, which can catalyze the microbial breakdown of wastes, may have contributed to the different weight reductions seen across these experimental units. Through the mineralization of organic materials, such actions promote the release of CO2.The residue turned black in colour and ready for harvest the rich black gold manure [19]. The increased growth and yields of joyweed in the field confirm our experiments on the positive effects of vermicompost and traditional compost on plant vermicompost and traditional compost on plant growth and yield. Increased growth and yield of joyweed in the 30th and 60th kitchen waste vermicompost to compare the paper waste vermicompost. The quality manure also contains some of the secretions of worm sand its associated microbes, which acts as growth promoters along with other nutrients [20]. Kitchen waste material is characterized with high values of pH, organic carbon. The process of vermicomposting activity significantly modified the physical and chemical properties of kitchen waste material that can be a key factor for organic farming [21]. The global food and nutritional security of the growing population is a great challenge, which looks for the new crop as a source of food and nutrition [22]. They were attributed to a number of positive effects of applications of vermicompost in field soils. One of these is the improvement of the biological properties of soils, such as increased microbial biomass and activity and the sustained supply of macronutrients such as nitrogen, phosphorus, and potassium. The increased synthesis of plant growth regulators such as humic acids and plant growth hormones adsorbed onto humic acids, which may have led to higher growth and yields of joyweed in the field, may have been significantly influenced by these increases.

3.8 Weight of Vermicompost

The weight of vermicompost produced by African night crawlers after feeding with Kitchen waste and paper waste as substrate was found significant. The final weight of vermicompost produced by kitchen waste composted (400kg) is higher when compared to the paper waste composted (300kg).

4. CONCLUSION

The Kitchen waste and Paper waste, can be degraded efficiently through vermicomposting using *Eudrilus eugeniae* than normal composting process. It is also interesting to observe that paper waste was degraded more efficiently than kitchen waste and that the paper waste had exhibited a good growth rate of worms. The low level of worm growth with length and height in kitchen waste vermicompost is due to the high level of pH content, the worms are very sensitive to high pH content. Due to low level of pH content, the worm grows well in paper waste vermicompost. Naturally the kitchen waste has high level of proteins, vitamins, minerals content, due to this content, the kitchen waste vermicompost has high nutrient level. The result of vermicompost soil test shows the high level of NPK micronutrients present in the kitchen waste to compare then the paper waste compost. Vermicompost is an effectively assimilated form of macro and micronutrients that plants are capable of utilising for growth and development. As a result of 30th& 60thday of Joyweed growth shows, the plant attains the maximum growth in kitchen waste vermicompost. when compared to control and paper waste vermicompost because of high level of NPK content found to the kitchen waste vermicompost. The final vermicompost's were homogenous, rich in important plant nutrients N, P, K, Fe, Zn, Cu and Mn which indicated the agricultural value as a soil conditioner. In the current study, we made vermicompost for kitchen and paper waste using African earthworms, *Eudruilus eugeniae*, and monitored the 30th and 60th days of soil nutrients and plant growth. Similarly, we will generate the vermi pit with the Indian earthworm species *Megascolecidae* and conduct further study on the sorts of nutrients found in kitchen

and paper waste vermicompost and the benefits of both compost types for plant growth.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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