A COMPARATIVE STUDY OF ORGANIC COMPOST AND VERMICOMPOST

Abstract

This comparative study analyzes the differences between organic and vermicompost fertilizers. Organic fertilizers are derived from natural sources such as animal manure and plant remains, while vermicompost is produced through the activity of earthworms on organic matter. The study examines the physical characteristics, and effects on plant growth of both types of compost. It also evaluates the potential benefits of compost. The results suggest that vermicompost has higher levels of nutrients and beneficial microorganisms, and can improve soil structure and water-holding capacity. However, organic compost may be more widely available and affordable. The study highlights the importance of considering the specific needs of crops and soil conditions when selecting a compost type.

Organic composting is the process of decomposing organic waste materials into nutrient-rich soil amendments through natural means. It examined the benefits and challenges of organic composting and its role in sustainable agriculture whereas, vermicomposting is a type of composting that utilizes earthworms to decomposing the organic waste material into nutrient-rich soil amendments. This inspects the benefits and challenges of composting and its role in sustainable waste management. The findings suggest that vermicomposting can be a sustainable and effective strategy for managing organic waste and improving soil health when implemented correctly.

This study overlooks at the effects of compost on plant growth (Amarathus, chilly, Ladies finger) and the possible advantage of using compost as a soil amendment. We were

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analysed two types of composting process organic compost and vermicomposting. In both techniques we use four parameters such as ring, bin, pit and heap methods. In this, more yield was obtained from ring method and less yield was obtained from heap method. But comparing vermicompost and organic compost, more yield was obtained from vermicompost. To find out whether vermicompost or organic compost is more effective in agricultural crops, the above mentioned composts were used as fertilizers in agricultural crops. From this we understood that agricultural crops grown in vermicompost were much more healthier.

I. INTRODUCTION

"Never plant without a bucket of compost at your side" (Elsa Bakalar).

India is an agro based economy. About 60% of Indian population relies directly or indirectly on agriculture. India has a long tradition of agriculture with a rich heritage of ecofriendly agricultural technologies. In India the tropical climate prevailing is very congenial for farming (Julka *et al.*, 1986). Waste management is a global challenge, especially economically in developing countries, because of their population growth, lifestyle changes, increasing people's living standards, and increasing waste generation (Taghipour.H *et al*., 2016).

India has the potential to produce 4.3 million tons of compost annually from municipal solid waste, reducing the gap between availability and demand for organic manure. Composting transforms raw organic residues into humus-like material, which can be used as soil amendment, seed starter, mulch, or natural fertilizer. Composting is the natural process of recycling organic matter, such as leaves and food scraps, into a valuable fertilizer that can enrich soil and plants. Anything that grows decomposes eventually; composting simply speeds up the process by providing an ideal environment for bacteria, fungi, and other decomposing organisms (such as worms, sow bugs, and nematodes) to do their work. The resulting decomposed matter, which often ends up looking like fertile garden soil, is called compost. Fondly referred to by farmers as "black gold," compost is rich in nutrients and can be used for gardening, horticulture, and agriculture (Shelia hu,2021).

Composting is an ancient agricultural technology going back to biblical times that still has important applications in modern agriculture (Mir Seyedbagheri, 2010). Microorganisms in the compost pile take up nutrients and hold them in their bodies, which prevents leaching (Demmel, 1980; Alleman,1982). Composting can be broadly categorized into aerobic and anaerobic composting (Vivek Manyapu, 2022). As the name depicts, aerobic composting methods are those which need turning or aeration to allow the flow of oxygen which is highly essential for the aerobic microbiota involved in the composting system, whereas in the anaerobic process, the anoxic condition is maintained to allow anaerobes to flourish and carry out the composting process. Composting is a controlled, aerobic (oxygen-required) process that converts organic materials into a nutrient-rich soil amendment or mulch through natural decomposition. The end product is compost – a dark, crumbly, earthy-smelling material.

II. ORGANIC COMPOST

Sir Albert Howard, the father of organic agriculture, emphasized the benefits of organic compost, a compost made from organic waste. India, the world's most densely populated country, generates nearly 100,000 metric tonnes of organic waste annually, which is rapidly increasing to 260 million tonnes by 2047. However, nearly 40%-60% of this waste is organic. To develop India into a superpower, this issue must be curbed in an eco-friendly manner. Compostable materials like food scraps, grass clippings, leaves, animal manure, and coffee grounds can be composted to create inexpensive organic fertilizers for lawns, gardens, and farms.

Farm compost, a biodegradable compost from organic waste sources, is produced under aerobic conditions by microorganisms, preventing environmental issues. Proper management ensures stable, pathogen-free end products (Alabi Olusoji David,2020). Food scraps, grass clippings, leaves, animal manure, and coffee grounds are all compostable. Composting is a process that uses organic waste materials like leaves, grass, fruits, and vegetables to produce humus, a natural fertilizer rich in fiber and inorganic nutrients. This process is beneficial for lawns, gardens, and farms, as it accelerates plant growth and is environmentally friendly. The composting process can vary depending on the method or equipment used (Grazia policastro *et al.*, 2022).

III. VERMICOMPOST

The word vermi is derived from Latin word which means ‘worm’(Edwards CA *et al.*, 2010). "Vermicomposting technology" is a fast growing one with its pollution free, cost effective and efficient nature. Since 2,350 years ago Aristotle was reported, vermiculture is basically the science of breeding and raising earthworms. It defines the thrilling potential for waste reduction, fertilizer production, as well as an assortment of possible uses for the future (Entre pinoys, 2010). Vermicomposting is a process that produces organic fertilizer or vermicompost from bio-degradable materials using earthworms. This eco-friendly method avoids waste disposal and provides high-quality compost. Earthworms are known for their role in breaking down organic matter, leaving behind valuable fertilizer. Vermiculture, also known as sericulture, involves the production of earthworms to convert organic waste into rich soil amendment, known as vermin compost. This method is particularly beneficial in developing countries like India, where nutrient cycling advancements are limited. The earthworm is a segmented invertebrate. A number of different species of earthworms have been used in vermicomposting. Some of the species commonly used in vermicomposting are *Dendrobaena veneta* (blue nosed worm),*Eisenia fetida* (tiger or brandling worm) and *Eisenia Andrei* (red tiger worm) and *Eudrilus eugeniae* (African earthworm).It is the litter dwelling earthworms (Epigeic worms),these are reproduce very rapidly and worms populations double every 60 to 90 days (Gunasegaran and Desai,1999).Vermicomposting is regarded as a clean, sustainable, and zero-waste approach to manage organic wastes but there are still some constraints in the popularization of vermicomposting. Instead of increasing research in the field of vermicomposting, practical application of vermicomposting needs more attention (Kavita Sharma, 2019).

Vermicomposting on a large scale is required to solve the problem of waste disposal effectively and on a global level (V. K garg). Over 7,000 varieties of earthworms can be found in a good soil but only a few species are suitable for vermicomposting. (Reginald Toussaint, 2012). Red worms *Eisenia foetida* is the most common used. Vermicomposting is a non-reactor process through which the ecosystem engineers ie, the epigeic earthworms ingest organic material and subsequently transform it to a nutrient rich humified organic fertilizer (Yadav and Madan, 2013).Vermicomposting is more efficient for pathogen destruction than composting, despite the thermophilic phase of the latter (Soobhany, 2018).

Vermiculture, introduced in the 1970s by biology teacher Mary Appelhif, uses red wiggler worms to compost kitchen waste. This innovative biotechnology converts agro-industrial wastes into value-added products, improving soil structure and fertility in organic farming. Earthworm casts, rich in organic matter and high in mineralization, enhance plant

availability of nutrients like ammonium and nitrate. Vermicomposting is cost-effective, viable, and rapid for efficient utilization of organic wastes and crop residues. (Dr. Afroz Alam, 2021).

IV. ABOUT THE ORGANISM

The organism selected for the comparative study of organic and vermicompost is *Eudrilus eugeniae,* belongs to the family Eudrilidae.

1. **Common Names:** African earth crawler, African night crawler, African earthworm, African red.

2. **Systematic Position**

    - Kingdom : Animalia
    - Phylum : Annelida
    - Class : Clitellata
    - Subclass : Oligochaeta
    - Order : Haplotaxida
    - Family : Eudrilidae
    - Genus : Eudrilus
    - Species : *Eudrilus eugeniae*

3. **Habit And Distribution:** *Eudrilus eugeniae* (Kinderg, 1867), a large-sized earthworm found in organically rich substrates, is abundant in savannahs, fields and refuse disposal sites of the Adamawa region of northern Cameroon (personal observation).They usually live in the soil's top few centimeters, but will burrow deeper to find essential moisture if the earth dries out or freezes. Although *E. eugeniae* is found only occasionally in the natural habitat in Kerala, this is the most widely used species for vermiculture and vermicomposting in Kerala. Being a tropical species, it shows preference for high temperatures, with maximum biomass production occurring at 25°C - 30 °C.

4. **Description:** The size ranges from 115 to 165 mm x 4mm with the total number of segments ranging from 160 to 200. The worm is reddish brown dorsally and pale sandy yellow ventrally. The setae are 8 per segment and lumbricine in arrangement. It is very active with rapid escape response when disturbed. Clitellum is located in segments 14 to 18 and incomplete ventrally. Cocoons are dark coloured with tapered lemon shape. It is a large worm that grows extremely rapidly. It has a high reproductive rate and is ideal for production of animal feed protein. The peak cocoon production is from June to the end of October. In Kerala, this species has been found to produce cocoons throughout the year except the drought months of April and May. Polyembryony resulting in the release of multiple juveniles from the same cocoon is an added feature of this species.The life cycle ranges from 50 to 70 days and its life span can be 1 to 3 years.

5. **Stages Of Composting Method:** There are five basic stages involved in all composting particles, Pavoni, *et al*., 1975 namely preparation, digestion,curing,screening and storage.

V. SCOPE OF THE STUDY

These fertilizers that are made by breaking down organic waste material into a nutrient-rich soil amendment. The scope of compost and vermicompost is vast, and they can be used in a variety of ways to improve soil health, plant growth, and overall sustainability. Organic compost is typically made by decomposing plant material such as leaves, grass clippings, food scraps, and other organic waste materials. Vermicompost, on the other hand, is made by decomposing organic waste materials using worms. Vermicompost can be used in a variety of applications, including as a soil amendment for gardens and lawns, as a potting mix for houseplants, and as a nutrient-rich tea for foliar feeding. Both organic compost and vermicompost offer numerous benefits for gardeners, farmers, and landscapers. They improve soil structure, water retention, and nutrient availability, leading to healthier plants and improved yields. They also help to reduce waste and promote sustainability by recycling organic materials that would otherwise end up in landfills. Both methods are beneficial way of improving the fertility of the plant and soil. A healthy soil is essential to produce vigorous, disease resistant plants.

VI. OBJECTIVES OF THE STUDY

- To identify the quality and quantity of compost from various waste materials.
- To evaluate the potentiality of the earthworm.
- To determine the increasing the growth of selected vegetable plant growth.
- To reduces the waste stream.
- To maintain healthy soil.

VII. REVIEW OF LITERATURE

Previous research studies, abstracts and significant writings of authorities in the area under the study are reviewed. This part of the report provides a background for the development of the present study brings the reader up to date. Since further research is based upon everything that is known about a problem, this section gives evidence of the investigator's knowledge of the field.

Arancon *et al.,*(2006) attributed the growth promoting effect of vermicompost to humic acids present in it.

Basheer. M and Agrawal.O.P. (2013) successfully utilized epigeic earthworm, *Eudrilus eugenia*e for the conversion of paper waste into vermicompost.

Benson & Othman, (1993) investigated that compost has been used as a substitute landfill liner as an alternative soilless plant growth media (Freeman & Cawthon, 1999), as a soil amendment and conditioner, as a fertilizer, for erosion control, and as a method for reducing herbicide use (Mitchell, 1997b).

Bresson *et al.,* (2001) countered this assessment, offering instead that structural changes resulted from interactions between added organic matter and the soil.

Chaoui H.I, *et al.*, (2003); Tiwari S.C, *et al.,*(1989) reported that Vermicompost is also rich in enzymes like amylase, lipase, cellulase and chitinase, which break down organic matter, improving soil nutrients and fertility.

Daigle *et al.,* (1989) reported that composting also reduces greenhouse gas emissions by reducing the quantity of material that is landfilled and decomposed, a process that produces methane.

de Bertoldi *et al.,* (1983) reported that composting is the microbial conversion of organic matter in the presence of suitable amounts of air and moisture into a humus-like product.

Doan *et al.,* (2015)reported reduction on leaching and runoff at highest quantity by vermicompost compared to control.

Edwards (1998) reported five earthworm species (*D. veneta, E. eugeniae, P. excavatus* and *P.hawayana* and *E. foetida*) to be the most potential earthworms for breakdown of organic refuse.

Gajalakshmi and Abassi (2004) reported that Vermicompost is a finely divided peat-like material with excellent structure, porosity, aeration, drainage and moisture-holding capacity.

Giraddi, R.S, *et al.*, 2008; Singha, R.P (2011) reported that earthworms digest municipal biosolids along with green mulch. About two thirds of this volume becomes vermicompost.

Govindan (1998) reported that earthworm body contains 65% protein, 14% fats, 14%carbohydrates and 3% ash.

Gunasegaran and Desai (1999) reported that the selection of species of earthworms for vermicomposting should focus on species where, consumption of organic biomass, rapid growth and reproduction is within short time span.

Gutiérrez *et al.,* (2007) tomatoes produced in VC amended substrate were more suitable for juice.

He *et al.,* (1992) Some compost (especially compost derived from MSW) typically has higher levels of trace metals especially Cu, Zn, and Pb, which can cause accumulation problems in soils with repeated applications.

Imam and Sharanappa (2002) reported that, composting of poultry manure with different crop residues (wheat and ragi straw) at varying ratios like 0.25:1, 0.5:1, 1.75:1 and 1:1 ratio for 3 months under vat method recorded high nutrient content in 1:1 proportion with the values of 3.5 % N,4.94% P and 2.1 % K and C:N ratio of 6:1.

Kashem *et al.*, (2015) reported higher tomato yield compared to inorganic fertilizers suggesting the significance of VC over inorganic fertilizers. Crops grown with VC amended soils are also found to have additive nutrient content compared to non-amended.

Lakshmi and Vijayalakshmi (2000) reported that earthworms are also known to contribute several kinds of nutrients in the form of nitrogenous wastes.

McConnell *et al.,* (1993) confirmed the reported decrease in bulk density with compost application.

Mitchell, (1997b) noted benefits to application of compost along roadsides include improvement of soils through addition of organic matter, nutrients, and microbes, improved plant growth, erosion control, slope stabilization, and reduction in the use of chemical fertilizers and herbicides.

Nair**,** *et al.,* (2006) reported that feedstock which are pre-composted for 10-14 days retain sufficient nutrition for the worms, but not so much energy that they are able to generate heat.

Nanden and Dipotaroeno (1996) the Ministry of Agriculture, Animal Husbandry and Fisheries (LVV) in Suriname made an attempt to investigate vermicomposting, but did not achieve significant results.

Pare *et al.,* (1998) on the transformations of carbon and nitrogen during composting of animal manures indicates that composting decreased all forms of carbon except nonhydrolyzable C, which remained relatively constant during the composting period. On the other hand, ammonia nitrogen and acid-hyrolyzable N were converted into nitrate nitrogen and nonhydrolyzable N forms only toward the end of the composting period. Those results indicate immature compost will contain ammonia nitrogen and acid-hydrolyzable N and could lead to considerable leaching of N.

Radhakrishnan.B and Muraleedharan. N (2010) reported that they (*Eisenia fetida , Eudrilus eugeniae* and *Perionyx excavates*) show high metabolic activity and hence are particularly useful for vermicomposting.

Ronald and Donald (1977) reported that 72% of the dry weight of an earthworm is protein and that the death of an earthworm will release up to 0.01 g of nitrate in the soil.

Seenappa, *et al.,* (1995) reported that earthworms are highly adaptable to different types of organic waste, provided, the physical structure, pH and the salt concentration are not above the tolerance level.

Sharma S, *et al.***,** (2005) reported that the plant growth regulators and other plant growth influencing materials i.e. auxins, cytokinins, humic substances etc, produced by microorganisms have been reported from vermicompost.

Torkashvand (2010) found that molasses as a readily carbon resource is a suitable ammonia suppressant for municipal wastes compost production to increase the total nitrogen

of the final compost. Application 8% molasses and 4% office paper respectively at the first and second stages caused to decrease C/N ratio.

Thakre and Fulzele (1998) opined that the addition of green leafy biomass in the process of composting was indeed genuine as the green leafy biomass was a good source of nitrogen helping degradation of lignocellulosic waste at a faster rate.

Yvonne Indrani Ramnarain, Abdullah Adil Ansari, Lydia Ori (2018) through this journal International Journal of Recycling of Organic Waste in Agriculture explained that Vermicomposting of different organic materials using the epigeic earthworm *Eisenia foetida*.

VIII. MATERIALS AND METHODS

1. **Materials:** The organism selected for the comparative study of organic and vermicompost is *Eudrilus eugeniae,* belongs to the family Eudrilidae. The other materials are coconut husk, hay, dry leaves, cow dung, vegetable waste, jute bag, plantain waste.

Table 1: Components used in Organic Compost

Sl. No.	Components
1.	Plantain waste
2.	Cow dung
3.	Dry leaves
4.	Hay
5.	Kitchen waste
6.	Jute bag

Table 2: Components used in Vermicompost

Sl. No.	Components
1.	Husk
2.	Plantain waste
3.	Cow dung
4.	Dry leaves
5.	Hay
6.	Earth worms (*Eudrilus eugeniae*)
7.	Kitchen waste (except citrus, egg shell, onion etc).

- **Collection of Materials:** For the present study, *Eudrilus eugeniae* were collected from Farming Systems Research Station, Sadanandapuram (Kollam Dist.) at 1000 worms. The organism were identified and authenticated by Dr. Manju Sebastian, Assistant Professor, Fatima Mata National College, Kollam and the organism were clearly depicted on the Fig:1.The other materials like vegetable waste, coconut husk, hay, dry leaves, cow dung, and plantain for the organic compost (Fig:2).

Figure 1: Earth worms (*Eudrilus eugeniae)*

Figure 2: Organic waste

2. **Methods:** Following methods are used for the comparative study of organic compost and vermicompost.

- Pit method
- Heap method
- Ring method
- Bin method

- **Pit Method of Organic Compost** (Sumiyati *et al.,* 2020): Compost pits use the same principle as trenches. Dig a hole, fill it with organic waste and cover with a topping of grass clippings or leaves. It is possible to space multiple compost pits in close proximity, creating pockets of nutrient-rich material that will feed the microbes and worms in the surrounding soil. The steps are:

- Dig the hole for compost pit. The compost pit should be about 1 ft (30.5 cm) deep. The area of the hole will be determined by the amount of organic matter want to add.
- Chop the compost materials finely. Underground composting happens at a much slower rate than above ground setup. Compost materials are adding layer by layer. We were added plantain waste on first layer, second layer was cow dung, the third layer was dry leaves and again add next layer cow dung then we added some hay as fourth layer and again next layer of cow dung is added and the fifth layer was the kitchen waste. The compost materials are chopped finely and added this materials to the compost pit.
- Cover the compost with jute bag. After adding compost materials to the pit, it was covered with the moisture jute bag. Improve decomposition by watering the compost area.
- Underground compost decomposes more slowly than above ground piles. Speed up this process by ensuring the area stays fairly wet with a garden hose.

- **Heap Method of Organic Compost** (Joseph Xorse Kugbe, 2021): The compost heap method involves dumping organic materials such as carrot peels, leftover vegetables, stale bread and any other foodstuff in the same place to decompose.

  - Lay a layer of coarse plant materials at the base (3 x 3 ft). This allows to drain off excess water and avoids water logging in the heap.
  - Insert a pole at the center. When the heap is made, loosen it as and when required to escape the excessive heat and give aeration.
  - Add a thick layer of well-moistened dry matter.
  - Mix a handful of forest soil giving fungal life to the compost and lay two leaves of Calotropis on either side to produce heat for fast decomposing.
  - Pour some slurry water on top to activate the bacterial life.
  - Add another thin layer of green matter and slurry on top of that. Maintain the ratio of dry to the green matter as 3:1.
  - Repeat steps 2-5 until the heap reaches the desired height (3-5 ft). Let the dry matter cover the top of the heap.

- **Ring Method of Organic Compost** (Srinivasarao *et al.*, 2014): Ring Compost is an on-site, capture and containment system used for organic material processing (starting the composting process) in an odour-free, easily accessible unit.

  - First we find out a ring for compost.
  - The organic wastes are adding layer by layer.
  - First we added plantain waste.
  - Cowdung is added to the second layer.
  - Dry leaves and hay added to third layer.
  - Again we added cowdung.
  - Then kitchen waste (all type of waste including vegetables and fruits) is added at last layer.

- **Bin Method of Organic Compost** (Somjai Karnchanawong,2011): Manage a bucket having lid to collect the organic waste. Collect the home organic waste and cut them into small pieces (1to2inch pieces) and put in the bucket. Transfer the chopped waste in the bin and remain closed the bucket all the time. Thereafter, go on collecting wastes in the same bin.

  - Find out plastic storage bin and Drillholes in it.
  - Added coir pith as first layer.
  - Then added chopped dry leaves and hay as second layer.
  - Added cowdung to it as third layer.
  - Then added all types of kitchen waste and added coirpith powder on layer by layer.

- **Pit Method of Vermicompost** (Salman Zafar, 2022)**:** Vermicomposting pits are mainly used by farmers. These farmers dig a large hole that serves the purpose of burying worms and organic waste material. Pits made for vermicomposting are usually 1 m deep and 1.5 m wide.

  - First we arranged coconut husk as base layer.
  - The compost pit is then layered to about 5 cm with dry leaves or preferably chopped hay/straw or agricultural waste biomass.
  - Handful-lumps of fresh cattle dung are then placed at random over the bed.
  - Earthworms are introduced to the compost bed.
  - And added kitchen wastes as top layer.
  - After this, the next 30 days the pit is kept moist by watering it whenever necessary.
  - The bed should neither be dry or soggy.
  - The pit may then be covered with coconut or Palmyra leaves or an old jute (gunny) bag to discourage birds.

- **Heap Method of Vermicompost**(Mary McMahon, 2023)**:** Heap method of vermicomposting is the method of composting where organic matter needs to be divided into different types and to be placed in heap one over the other, covered by thin layer of soil or dry leaves and add earthworm to it. The materials are added as layer by layer and made this as a heap.

  - At the bottom we use coconut husk as a base layer.
  - Then we added plantain waste and add cow dung to it.
  - Then we added dry leaves and hay to it and add some dried cowdung to it.
  - Then Add worms to it.
  - At last the kitchen wastes are added to it except citrus fruits and cover the heap by jute bag.

- **Ring Method of Vermicompost** (Sreenivasan ettamal, 2018)**:** Vermicompost units are used to provide bedding or food materials for earthworms, controlling moisture levels, providing food, and creating a conducive environment for breeding. These materials can be converted from agricultural residues, dry leaves, pigeon pea stalks, ground nut husk, soybean residues, vegetable wastes, weed plants, water hyacinth, and fiber from

coconut trees. Other raw materials include animal manures, food industry wastes, municipal solid wastes, biogas sludge, and bagasse from sugarcane factories. Bedding can also be made from shredded leaves, straw, kitchen and garden waste, deoiled cakes, grains, cereal, or aged manure. Large-scale or commercial vermicomposting systems require reliable sources of food, such as cow manure, sewage sludge, and grocery waste. Bedding materials high in cellulose are best for aeration and worm breathing. Adding soil or sand can provide grit for the worm's digestive systems, and all bedding materials must be free from pesticides.

- **Bin Method of Vermicompost** (Rofiqul umam, 2021)**:** The most convenient method of performing this procedure is to move the compost to one side of the bin and add new bedding and garbage to the other. Allow about one month for the worms to migrate to the fresh material. At this point the compost may be removed and replaced with new bedding.

  - The bin should be dark and opaque and should, have a lid, drainage, and aeration holes in the bottom. Small 1inch legs and a tray underneath the bin are also helpful.
  - First we added coir pith powder as first layer.
  - Then added some dry leaves and hay to it as 2nd layer.
  - Added some cowdung to it as 3rd layer.
  - Added worms to it.
  - Finally added kitchen waste (except citrus fruits, egg shell etc.) as last layer.
  - Harvest the castings after 2 weeks.

IX. RESULT

In this present study, comparison of organic and vermicomposting were carried out. Four methods (Pit, heap, ring and bin) were analysed for the work, and also collect yield from these methods. The yield of compost were applied in the selected vegetable crop plants namely *Amaranthus cruentus* (L.)*, Capsicum annuum* (L.), *Abelmoschus esculentus* (L.) Moench. The pest visitors were clearly monitored from the field.

1. Selected Types of Compost

Table 3: Types of Compost

Sl. No.	Types
1.	Organic compost
2.	Vermicompost

The data in table - 3 indicate organic and vermicompost system had an influence on the waste management system. The higher quality of compost is vermicompost. The study has shown increase the efficiency of compost. In organic compost, which is purely made by natural degradation of organic waste whereas vermicompost was made by the biological degradation of waste with the help of earthworms.

2. Methods of Organic and Vermicompost

Table 4: Different Methods of Compost

Sl. No.	Methods
1.	Pit
2.	Heap
3.	Ring
4.	Bin

For this present study we were analysed four different methods (Table - 4). From the result all methods were supported for the agricultural practices. Pit and heap methods were easy for waste management system. When compared to pit method, heap method is a little time-consuming process. A pit of 40x40x30cm size was used for pit method. Ring method is done by using concrete ring (1m x 0.5 m). Biobin (16 x 11 cm) was taken for the degradation of the waste in bin method.

3. Visitors in Compost

Table 5: Pest of Compost

Sl. No.	Visitors
1.	Ants
2.	Snail

While analysing our project we were clearly monitored some visitors in our compost like ants, snails etc. These pests are threat to earthworms and affect its growth. But actually they are a sign of a healthy compost pile and can help to speed up the decomposition process.

4. Yield of the Compost

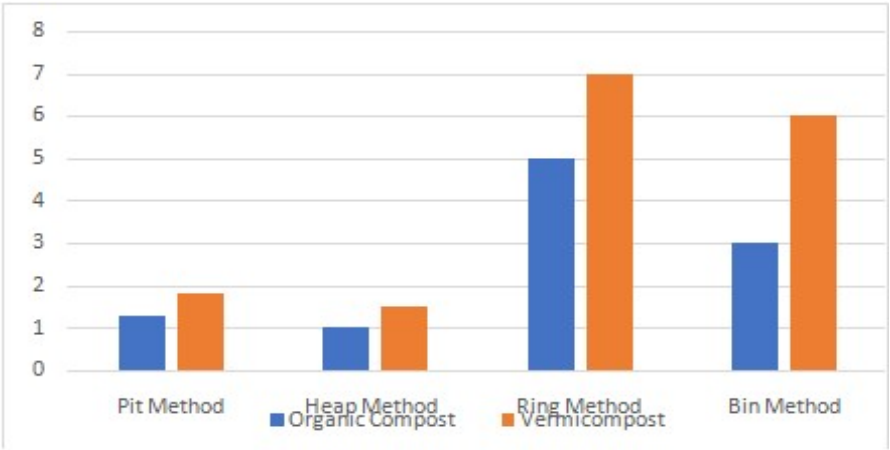

Figure 3: Yield of organic and vermicompost

The result of Fig: 3 indicates the yield of organic and vermicompost methods. During the study maximum yield of organic compost obtained from ring method is 5Kg while vermicompost is 7 Kg. The least quantity of organic compost obtained from heap method is 1 Kg and vermicompost is 1.5 Kg.

5. Selected Species of Cultivated Vegetable Crops

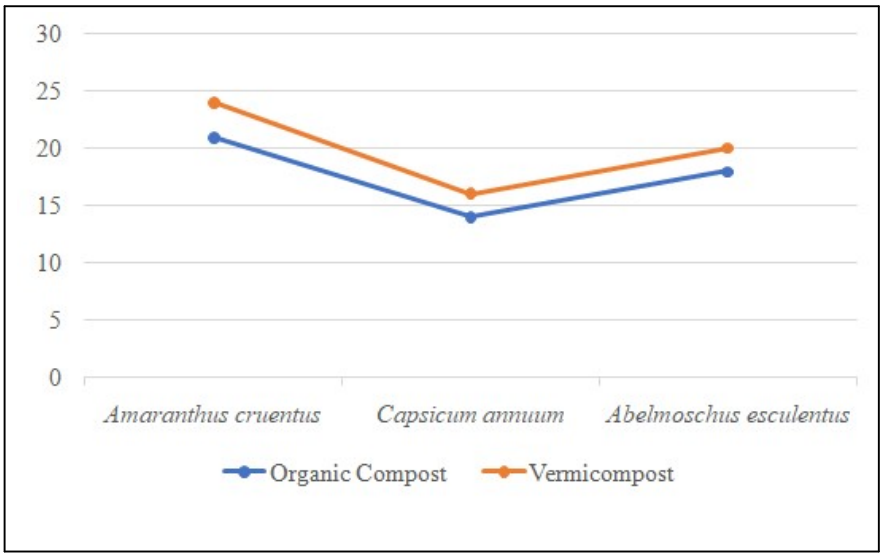

Figure 4: Distributions of the sample.

The obtained compost was applied in crop plants. During the study period three vegetable crop plants belonging to different families were subjected to study. Taxa in this study includes families such as Amaranthaceae, Solanaceae and Malvaceae. Growth is observed throughout the study (*Amaranthus cruentus*(L.) – 24 cm in 27 days, *Capsicum annuum*(L.) – 16cm in 20 days, *Abelmoschus esculentus* (L.) Moench – 20cm in 25 days). The study has shown that vermicompost used to improve the quality of three vegetable crops. All of the plants grown with enriched vermicompost were significantly higher than organic compost.

X. DISCUSSION

Globally, 11.2 billion tonnes of solid waste are collected annually, with organic decay contributing to 5% of global greenhouse gas emissions. The Kerala State Pollution Control Board (KSPCB) states that less than 10% of garbage is segregated at the source, making it difficult to manage and treat. This study focuses on waste management systems, focusing on organic and vermicompost composting as cost-effective and eco-friendly methods. Organic composting uses 100% kitchen waste, while vermicomposting uses earthworms collected from Farming Systems Research Station. Composting breaks down organic waste into nutrient-rich soil amendments, which can be used to fertilize plants, gardens, and crops.

Organic waste can be recycled into valuable products like compost and biogas, which can be used for agricultural practices. Vermicomposting is a green technique that uses

earthworm species to produce organic compost from organic waste, resulting in nutrient-rich compost that improves plant health and fertility. This process is becoming popular as people seek to reduce waste and create a sustainable lifestyle. A study was conducted to evaluate composting techniques and their potential benefits.

There are several methods for composting process. Among them, four methods are selected which are easy, cheap, time-bound and natural. S Sumiyati *et al.,* (2020) explained principles of pit method for composting. Compost pits are used to make manures and fertile compounds by dumping decaying biodegradable items. This method is effective for those who want their decomposing organic matter to be completely out of sight. Mary Appelhof, (1997) author of "Worms Eat My Garbage: How to Set Up and Maintain a Worm Composting System," the heap method of composting is an effective way to recycle organic waste, and it is particularly useful for larger-scale composting operations. The heap method is most common and traditional easy to set up and requires minimal equipment, making it a popular choice for farmers, landscapers, and others who generate large quantities of organic waste.

The ring method (Stu Campbell 1975) of composting is an effective way to recycle organic waste on a small scale. According to him this method is particularly useful for those with limited space or who live in urban areas where outdoor composting may not be practical. This method can create a valuable resource for their garden. David Beaulieu (2020) explained that a compost bin is a container into which you place organic waste to turn into compost (organic material) over time. The decomposition process will eventually take place over time in a compost "pile" or "heap," even without any housing to contain the matter. Compost bin is a great way to reduce the amount of garbage that use send to the landfill. Our study was a great success in knowing and sorting the most efficient and user friendly composting method. When one of them was reviewed, the organic compost method was found to be the best. Because compost can be obtained from organic waste in any environment and using any method. Therefore, all four methods of organic composting were successful. But in vermicomposting bin and ring methods seems to be successful. Because the earthworms used in this have doubled as well as a large amount of compost has been obtained. So we concluded that pit and heap methods are less profitable because we observed less number of worms in harvested compost.

Dr. E Sreenivasan (2018) reported that the common visitors in compost are insects, small animals etc and they can play a valuable role in the composting process. Like that we also observe some visitors such as ants, snails etc. While some gardeners may find these visitors unsightly or bothersome, they are actually a sign of a healthy compost pile and can help to speed up the decomposition process. They break down organic matter and control the population of other pests that might be attracted to the compost pile, such as flies or mosquitoes. Ants can kill earthworms, so it is harmful for vermicompost.

The study compared organic and vermicompost methods, analyzing four methods. The ring method yielded the best results, with 5 kg of organic compost obtained by the ring method and 7 kg by vermicomposting. Vermicomposting was found to be economically profitable, as it increases plant nutrient availability and productivity. The study found that vermicompost methods are suitable for food crops, and compost improves soil fertility in

gardens, landscaping, horticulture, urban agriculture, and organic farming. The results suggest that vermicomposting is an economically viable method for plant growth.

XI. SUMMARY AND CONCLUSION

In India our current waste disposal practices and attitude is to just get rid of the waste and throw it away. Waste management system or waste disposal is a streamlined process that organizations use to dispose, reduce, reuse, and prevent waste. Waste management is a major problem for many of the urban agglomeration in our country. Compost can be useful as a natural fertilizer and it's way more environment friendly than synthetic fertilizers. Compost is a mixture of ingredients used as plant fertilizer and to improve soil's physical, chemical, and biological properties. It is commonly prepared by decomposing plant and food waste, recycling organic materials, and manure. The compost providing rich nutrient content, which includes essential plant nutrients such as nitrogen, phosphorus, and potassium, as well as beneficial microorganisms that help to improve soil health and fertility. The present study aim with the comparative study of organic and vermicompost.

Organic waste treatment is an essential part of the waste management programmes almost all over the world. Environmentally sound methods of disposing of vast quantities of organic wastes generated by municipalities, agricultural farming, animal agriculture, logging, and industries has been a hot issue in recent decades. Past practices of lagooning and surface applying the wastes without treatment has led to surface and groundwater contamination, air pollution, and has presented other health and safety concerns. Organic composting is a controlled, aerobic process that converts organic materials into a nutrient-rich soil amendment or mulch through natural decomposition. It is commonly prepared by decomposing plant and food waste, recycling organic materials and manure. The resulting mixture is rich in plant nutrients and beneficial organisms, such as bacteria, protozoa, nematodes and fungi. Organic compost is the compost made from organic wastes. Food scraps, grass clippings, leaves, animal manure and coffee grounds are all compostable. Composting is useful for making inexpensive organic fertilizers for lawns, gardens, and farms to accelerate plant growth. Composting of organic wastes has become a principal method of waste reduction, disposal and reuse because it produces a final product that is stable, free of pathogens and plant seeds and can be beneficially applied to land. Treatment of solid organic waste is an essential part of the waste management programs all over the world. Organic compost boost up the acceptance of kitchen waste in the developed world.

Vermicompost is ecofriendly and cost efficient method. It is an ideal method for the management and development of solid waste. This compost will be helpful for managing domestic solid waste problems and could stabilize wastes with low toxicity, pathogens and heavy metals. Vermicomposting progresses due to the earthworm and the microbes associated with the gut and soil. Earthworm’s gut and soil microbes have an immense effect in completing the vermicomposting process. Various enzymes produced by gut microbes help in digesting the organic matter. The end result of a successful composting treatment is a useful soil amendment that can be used as a fertilizer, to reduce erosion, as an amendment to degrade organic contaminants or even as a landfill cover material. Therefore the resulting compost could be used in organic farming. Vermicompost have higher level of available nutrients. Within 60days a large quantity with high quality of compost was produced by

Eudrilus eugeniae (earthworm). Multiplication of earthworms leading to the degradation of waste particles.

In this composting techniques (organic and vermicomposting) we selected four parameters (Ring, bin, pit and heap method). After completion of these methods we got good result in ring method. Other methods are successful to increase the fertility of the soil. In organic composting all four methods were successful whereas in vermicomposting, bin and ring method was the most effective one. Common pest were noted from the vermicomposting field (Ants, snail etc). They are not directly attack earthworms but it will be cause reduction in number of worms. The field should be protected from pest for better result. The overall finding of the study indicate the gradual application of vermicompost produce good quality and that can be used to stimulate growth in terms of height, number of leaves and elongation of stem. Finally we reached the conclusion that vermicomposting is the most efficient method, because the plants (*Amaranthus cruentus* (L.), *Capsicum annuum*(L.), *Abelmoschus esculentus* (L.) Moench) grew much better in vermicompost than in the organic compost.

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