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COMPOSTING USING COW MANURE, BANANA PLANT WASTE AND VEGETABLE SCRAPS AS THE INGREDIENTS

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Abstract - *Vermicomposting represents a straightforward biotechnological method of composting, employing specific earthworm species to transform organic waste into nutrient-rich compost. In contemporary agricultural practices, chemical fertilizers are predominantly utilized, leading to soil pollution, reduced fertility, and groundwater contamination. Vermicompost offers a viable alternative, addressing these challenges by utilizing organic waste. Notably, vermicompost boasts superior water retention capabilities, thereby enhancing soil fertility. This technology is recognized for its environmental friendliness and sustainability. The aim of this study is to explore various techniques employed within the industry and research communities to develop vermicompost from organic waste, optimizing methodologies derived from these investigations. It involves conducting stability tests on the resulting vermicompost and conducting comparative analyses with existing vermicompost products. Additionally, the study aims to incorporate various organic wastes such as sawdust, rice husk, cocopeat, and perlite in different combinations to create a base material for planting. The growth of identical plant species and batches of saplings will be monitored and compared based on parameters including height, foliage density, and flowering. The future prospects of this research extend to utilizing vermicompost for bioremediation purposes, particularly in the purification of polluted water in rivers and streams. This involves leveraging the properties of vermicompost to remove toxic heavy metals and other contaminants from water bodies, thus contributing to environmental restoration efforts.*

***Key Words*:** Vermicomposting, Earthworms, Organic waste,Compost, Chemical fertilizers, Groundwater contamination, Techniques, Bioremediation.

1.BACKGROUND

Composting using cow manure, banana plant waste, and vegetable scraps as ingredients has deep roots in agricultural practices spanning millennia. Originating from ancient civilizations like the Egyptians, Greeks, and Romans, who understood the benefits of decomposing organic matter to enhance soil fertility, this practice persisted through the Middle Ages in Europe and experienced a revival amidst the Industrial Revolution's technological advancements. However, it wasn't until the latter half of the 20th century that a modern understanding of composting emerged, driven by environmental awareness and concerns over pollution. The selection of cow manure, banana plant waste, and vegetable scraps as compost ingredients demonstrates a sophisticated understanding of their synergistic properties. While cow manure provides essential nitrogen, banana plant waste and vegetable scraps contribute carbon, striking a balance that yields nutrient-rich compost beneficial for soil health and plant growth. Today, this method finds application in diverse settings, from community gardens to commercial agriculture, reflecting a timeless practice adapted to contemporary sustainability goals.

2.INTRODUCTION

Composting with a blend of cow manure, banana plant waste, and vegetable scraps is a holistic approach to sustainable gardening. Cow manure kick-starts the decomposition process with its high nitrogen content, fostering a thriving microbial community essential for breaking down organic matter. The addition of banana plant waste enriches the compost with potassium, offering plants vital nutrients for robust growth and disease resistance. Meanwhile, vegetable scraps contribute a diverse array of nutrients, ensuring a balanced compost mix that supports healthy soil and plant development. This synergistic combination not only reduces organic waste but also produces a nutrient-rich soil amendment that enhances soil fertility, promotes plant vitality, and embodies environmentally responsible gardening practices.

3.VERMICOMPOSTING

Vermicomposting is a natural and efficient method of composting organic waste, utilizing the digestive power of worms to break down materials into nutrient-rich compost. Typically conducted in bins or containers either indoors or outdoors, the process begins with a suitable bedding material to provide a habitat for the worms and absorb moisture. Red worms or red wigglers are then introduced to the bin, where they feed on kitchen scraps, yard waste, and other organic matter. Regular maintenance, including monitoring moisture levels and turning the compost, ensures optimal conditions for decomposition. After a few months, the compost is ready for harvesting, yielding a valuable soil amendment known as vermicompost. This nutrient-rich

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material can be used to enrich garden soil, nourish potted plants, or as a top dressing for lawns, promoting healthy plant growth while reducing waste sent to landfills. Overall, vermicomposting offers individuals and households a sustainable and eco-friendly approach to managing organic waste and improving soil health.

Figure-01: Vermicomposting.

4.ROLE OF VERMICOMPOSTING AND ITS IMPORTANCE IN PLANT GROWTH

Vermicomposting is the process of using earthworms to convert organic waste materials into high-quality compost. This process involves the decomposition of organic matter by earthworms and microorganisms, resulting in nutrient-rich soil amendments that can be used to enhance plant growth. Here's a breakdown of its role and importance:

Organic Waste Management: Vermicomposting provides an eco-friendly solution for managing organic waste such as kitchen scraps, yard waste, and agricultural residues. Instead of sending these materials to landfills where they would generate methane, a potent greenhouse gas, they can be recycled into nutrient-rich compost.

Nutrient Enrichment: Vermicompost is rich in essential plant nutrients such as nitrogen, phosphorus, potassium, calcium, and magnesium. These nutrients are released slowly over time as the organic matter decomposes, providing a steady supply of nutrients to plants.

Microbial Activity: Vermicomposting encourages the growth of beneficial microorganisms in the soil. These microorganisms help break down organic matter, improve soil structure, and suppress harmful pathogens, promoting overall soil health.

Soil Structure Improvement: Vermicompost improves soil structure by increasing soil aggregation and porosity. This allows for better water infiltration and retention, as well as improved root penetration and aeration, which are crucial for plant growth.

pH Regulation: Vermicompost helps regulate soil pH, making it more conducive to plant growth. It can buffer acidic or alkaline soils, bringing them closer to neutral pH levels, which are optimal for most plants.

Disease Suppression: Vermicompost has been shown to suppress certain soil-borne diseases and pests, reducing the need for chemical pesticides and fungicides in agricultural systems.

Materials Used in the Vermicomposting

There are mainly three materails used in the vermicomposting that is Cow Dung, Waste of the banana plant, and vegetable wastes. The details of the vermicomposting materials is given below:

5.COW DUNG IN THE VERMICOMPOSTING

Using cow dung in vermicomposting is a common practice and can be highly beneficial for the process. Cow dung is rich in organic matter and essential nutrients, making it an excellent addition to vermicomposting bins. When properly utilized, cow dung helps in balancing the carbon and nitrogen ratio in the compost, providing food for the worms, and aiding in the decomposition process. Additionally, cow dung introduces beneficial microorganisms that contribute to the breakdown of organic matter and the creation of nutrient-rich vermicompost. However, it's essential to use well-aged cow dung to avoid any potential issues with pathogens or unwanted seeds. Properly layering cow dung with other organic materials and monitoring the moisture levels and temperature in the vermicomposting bin are crucial for ensuring optimal conditions for worm activity and decomposition. By incorporating cow dung into vermicomposting, you can produce high-quality compost that enriches the soil and promotes healthy plant growth.

Figure-02: Cow Dung

6.WASTE OF BANANA PLANT IN THE VERMICOMPOSTING

Banana plant waste represents a valuable resource in the realm of vermicomposting, offering numerous benefits to the composting process. Rich in organic matter and essential

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nutrients such as potassium, phosphorus, and calcium, banana plant waste serves as an excellent addition to vermicomposting bins. Its fibrous nature contributes to the structural integrity of the compost pile, facilitating proper aeration and moisture retention. Moreover, the diverse array of organic matter present in banana plant waste fosters microbial activity, crucial for the decomposition of organic materials into nutrient-rich compost. To optimize its decomposition, chopping or shredding the waste into smaller pieces is advisable, allowing for easier consumption by composting worms. Alternating layers of banana plant waste with other organic materials like kitchen scraps or shredded paper promotes a balanced carbon-to-nitrogen ratio, essential for efficient decomposition. Regular monitoring of moisture levels and temperature ensures an ideal environment for worm activity and decomposition. By integrating banana plant waste into vermicomposting practices, individuals can harness its nutritive value, recycle organic material, and produce compost that enhances soil fertility and supports robust plant growth.

Figure-03: Waste of Banana Plant.

7.VEGETABLE WASTE IN THE VERMICOMPOSTING

Vegetable waste is a highly valuable component in vermicomposting due to its rich organic content and nutrient composition. When incorporated into vermicomposting bins, vegetable waste provides essential food sources for composting worms, such as Eisenia fetida, aiding in their growth and reproduction. Additionally, vegetable waste contains a diverse array of nutrients, including nitrogen, phosphorus, and potassium, which are gradually released during decomposition, enriching the resulting vermicompost with valuable plant nutrients. This nutrient-rich compost serves as an excellent organic fertilizer, promoting soil health and supporting robust plant growth. Moreover, vegetable waste helps maintain proper moisture levels within the vermicomposting system, creating an optimal environment for microbial activity and decomposition. By diverting vegetable waste from landfills and integrating it into vermicomposting practices, individuals can effectively recycle organic material, reduce waste, and produce high-quality compost for use in gardening and agriculture.

Figure-04: Vegetable waste.

Table-01: Ratio of the Material Used in the Vermicomposting.

Serial Number	Name of Material Used in the Vermicomposting	Ratio
01	Manure of cow	One
02	Manure of cow and banana plant waste	Three ratio Two
03	Manure of cow and banana plant waste and vegetable scraps	Three Ratio One Ratio One
04	Manure of cow and vegetable scraps	Three Ratio Two

8.RESULT AND DISCUSSION

The tests were carried out at the ambient temperature of 28–320 C with the moisture maintained at 40% by sprinkling 250 ml water/bed on alternate days. Composting was carried out in open bed of volume 45 cm3 in thatched sheds. 40 adult E. Fetida worms were introduced into 150 kg of pre-treated organic waste. When the compost was ready by its physical appearance, as judged by development of a dark brown to black color with uniformly disintegrated structure, watering was stopped.
One or two days later, the compost was removed from the tank together with the worms, heaped on a paddy waste and kept in the shade. The compost was removed from the top leaving the earthworms in a bundle at the bottom. The total biomass of earthworms was estimated by counting the number of adults, juveniles and cocoons from each replication. Conventional compost, i.e. without earthworms, was also prepared both by sealed and open methods for comparison. The times taken for composting and compost

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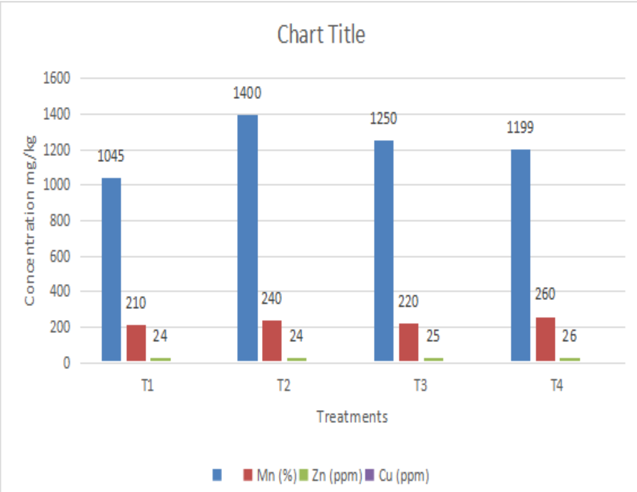
recovery were noted. The ratio of decomposed (2 mm) of the organic waste by weight in the compost was determined by sieving.



Graph-01: Micronutrient content of different composts in the comparative study to assess the efficiencies of earthworm species for biodegradation of organic wastes.

9.CONCLUSION

Eisenia. Fetida reduced the time required for vermicomposting significantly due to a maximum feeding rate. The reproductive potential of 40 Eisenia. Fetida 150kg of vermicompost in 55 days exceeded that for other local earthworms in 60 days. Humiliation indices provided a higher degree of vermicompost maturity for other worm'svermicompost. The enrichment had a major effect on the nutrient at ease of composts, particularly N, P and K. Use of vermicompost as a bio inoculant stimulated the nitrogenize enzyme activity in cow-pea, improved the quality of products in banana cow dung and vegetable waste and stimulated higher tuber establishment in cassava. It increased the availability of N and P and encouraged multiplication of beneficial micro-organisms. By attaching vermitechnolgy, the conversion from chemical nutrition to bio-nutrition can be fast, without an important harm in yield. This helps in the controlling of land without disturbing ecological processes.

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