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# MICROBIAL COMMUNITY ENHANCEMENT FROM KITCHEN WASTE VERMICOMPOST PROCESSED BY *EUDRILUS EUGENIAE*

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## ABSTRACT

*Vermicomposting is the most widely accepted method for recycling of organic waste. Therefore, in the present study, the kitchen waste was processed with earthworm,Eudrilus eugeniae and vermicompost was produced by Pot and Raised bed method. The compost and vermicompost analysed for microbial composition. After analysis, significant enrichment in the microbial composition observed in the vermicompost when compared with compost (control). Therefore, it can be concluded that by using vermicomposting method, the organic waste can be transformed into more beneficial product by the activity of earthworms. Moreover, earthworms also increase the population of microorganisms in the vermicompost.*

**KEYWORDS :** *Kitchen waste, Eudrilus eugeniae, Vermicompost, Microbial population .*

## INTRODUCTION

The enormous increase in the waste has significant impact on the overall solid waste management and also impacts on the environment. Different types of biodegradable wastes can be recycled in to compost and vermicompost. Vermicomposting is the process where earthworms are used for transforming the organic waste into enriched and more stable product. (Lazcano *et al*., 2008) [5]. The various types of microorganism present in the vermicompost include different species of bacteria, fungi, actinomycetes etc. These microbes secrete various degradative enzymes or chemicals that are essential for breakdown and mineralization of organic substrate into simple and bioavailable form of the nutrients (Atiyeh *et al*., 2002[1];Pathma and Natarajan, 2012 [9]).

Several workers have studied vermicomposting process and also analysed the microbial population. Sen and Chandra (2009)[14]stated that microbial population and structure are important indicators for evaluation of maturity of composting and vermicomposting Puneet and Agarwal (2012)[11]have carried out vermicomposting of vegetable market waste by using *Eudrilus eugeniae*. Dominguez*et al*., (2013)[2]observed the variations in the composition and activity of bacterial population during vermicomposting. They stated that microorganism have beneficial influences on soil quality and plant growth. Natalia and Victor (2015)[8]studied the diversity of microorganisms from organic fertilizer produced from composting of agricultural residues. They stated that microorganisms are very important for degradation of organic matter. Indumati (2017)[4] converted the vegetable waste into fertilizer bymicroorganisms.

The present study has been carried out with the aim of recycling the kitchen waste generated at household by most suitable method of vermitechnology. Later on microbial

assessment of this vermicompost to observe the changes in the population of microbes in presence of earthworms will be studied.

## MATERIALS AND METHODS:

The study was carried out during 2019 to 2020 at Sir Vishveshwarayya Housing Society, Solapur (M.S). Kitchen waste was collected and sundried for ten days. Cow dung was added on this dried kitchen waste and subjected for decomposition for one month. Earthworm, *Eudrilus eugeniae* used for production of vermicompost. The vermicompost was produced by two methods i.e. pot method (10 kg capacity) and raised bed method (10 x 3 x 2 feet). Earthworms were added into vermicomposting mixture and decomposed for 60 days and vermicompost was harvested.

Following treatments were used,
T1- Compost- Kitchen waste decomposed,
T2-Vermicompost produced from kitchen waste by pot method,
T3-Vermicompost produced from kitchen waste raised bed method.

This vermicompost subjected for microbial analysis. The analysis of microbial population was carried out by spread plate method. The bacteria, fungi, nitrogen fixing bacteria and phosphate solubilizing bacteria were isolated from vermicompost by culturing them on various growth media.

Nutrient agar was used for growth of bacteria, Sabourod's agar used for fungi, Ashbays agar for nitrogen fixing bacteria and Pikovskayas agar for growth of phosphate solubilizing bacteria. These microbes were grown at$10^{-3}$ dilution. Microbial colony count was done by using digital colony counter. Gram staining was carried out to understand the gram nature of bacteria whereas fungi were stained with Lactophenol cotton blue stain.

## RESULT:

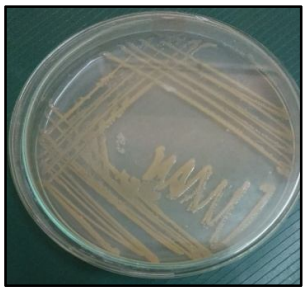

**Figure 1: Bacterial growth on nutrient agar.**

**Figure 2: Fungal growth on Sabouroud's agar.**

**Table 1: Microbial population of kitchen waste vermicompost processed by *Eudrilus eugeniae* at $10^{-3}$ dilution.**

| Microbes | T1 | T2 | T3 |
|---|---|---|---|
| Bacteria | 126.33 ± 2.52 | 172.69 ± 3.62 (37.59%) | 190.01± 2.85 (50.40%) |
| Nitrogen fixer | 38.41 ± 0.46 | 49.32± 0.73 (28.40%) | 57.28± 1.26 (49.12%) |
| Phosphate solubilizer | 42.22 ± 0.80 | 63.61± 0.89 (50.66%) | 75.49± 1.58 (78.80%) |
| Fungi | 23.53 ± 0.39 | 35.46± 0.70 (50.70%) | 43.82± 1.09 (86.23%) |

Bracket value indicates percentage variation.

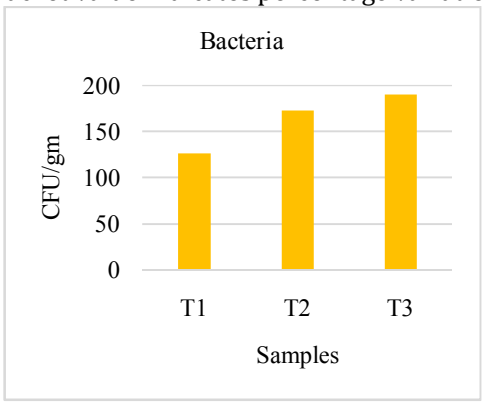


**Figure 3: Bacteria from kitchen waste vermicompost.**

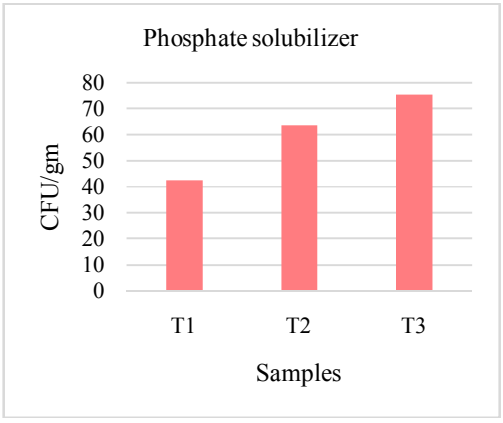


**Figure 4: Phosphate solubilizing bacteria from kitchen waste vermicompost.**

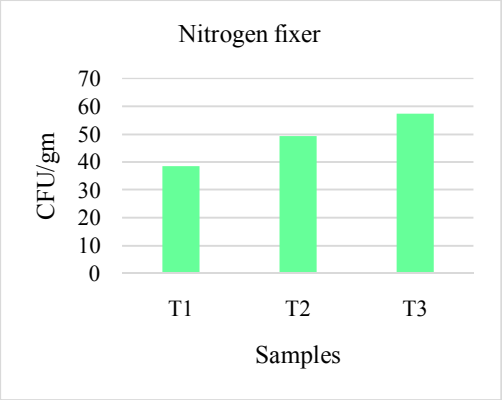


**Figure 5: Nitrogen fixing bacteria from kitchen waste vermicompost.**

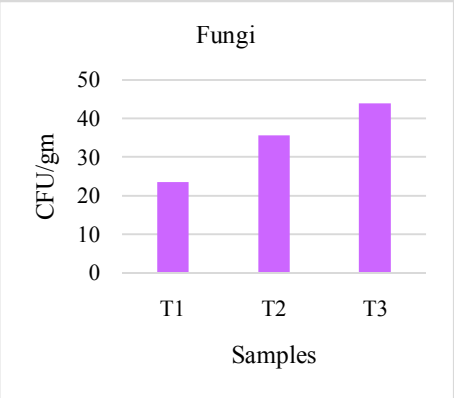


**Figure 6: Fungal population from kitchen waste vermicompost.**

In the present study, the vermicompost was produced from kitchen waste by pot and raised bed method. The results are presented in table 1 and graph 3 to 6. The analysis of microorganisms from compost (T1), vermicompost produced by pot method (T2) and vermicompost produced by raised bed method (T3) revealed that when compared with control, significant increase in the bacteria, Phosphates solubilizers, nitrogen fixers and fungi was noticed in T2 and T3.

## DISCUSSION:

The earthworms and microbes play key role in decomposition process. During vermicomposting process, microbes break down organic matter into humus. The present study revealed the significant enhancement in the microbial population in the vermicompost samples as compare to control. This can be attributed to the role of earthworms because they influence microbial growth in their body by offering them suitable environmental conditions (Dominguez *et al*., 2013[2]; Pathma and Sakthivel, 2012[8]). Similar observations have been reported by many workers.

Priya Koushik (2008) [10]reported enrichment of microorganisms in the vermicompost. Mulani *et al.,* (2010)[6] have stated that enhancementof microorganisms in the vermicompost is because of the earthworms. According to Swer *et al.,* (2011)[15] when favourable conditions are available, the microbial activity increases rapidly. Rao *et al*., (2012)[13]analysed the microbial population of vermicompost processed by earthworm *E. eugeniae* and noticed prominent increase in the number of fungi, bacteria, actinomycetes, phosphate solubilising bacteria and azotobacter in vermicompost when compared with control. They also stated that enrichment of microbes is because of earthworms. According to Emperor

and Kumar (2015)[3], the earthworm gets nutrients from decayed organic substrate and also multiply microorganisms. Ranchana Kapila (2021)[12]observed the augmentation of different species of bacteria and fungi in the vermicompost formed from organic waste with the help of *E. foetida*.

## CONCLUSION:

Earthworms act as natural decomposers as well as they support the growth of essential microorganism which helps in the breakdown of organic substrates. The final product formed by the joint activity of earthworms and microbe contains the rich microflora and simpler forms of essential nutrient. If applied on soil, increases soil texture and support the plant growth.

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