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STUDY OF MID-GUT MICRO-FLORA AND MICROBIAL POPULATION IN EARTHWORM CASTS OF COMPOSTING EARTHWORM *EISENIA FETIDA*

Bahekar, R.S., There, Y.W. & Ramdham, D.D.

Taywade College, Mahadula-Koradi, Dist. Nagpur

Corresponding author: yogeshwthere@gmail.com

ABSTRACT:

A bacterial and fungal population is analyzed in the gut of composting earthworm *E. fetida*. Result indicates bacteria constitute 12 ± 0.58 (CFU$\times 10^7$ /g) followed by fungi 8 ± 0.33(CFU$\times 10^3$ /g) and actinomycetes 4 ± 0.33(CFU$\times 10^3$ /g). Fresh cast contains 26 ± 1.45 (CFU$\times 10^7$ /g) bacteria, 13 ± 1.15 (CFU$\times 10^3$ /g) fungi and 10 ± 0.88 (CFU$\times 10^3$ /g). Microbial population is more in cast due to rich in nutrients and large surface area available for growth and reproduction of microbes. Microbial population seems to be depending on type of feed material and increased significantly when reared in nutrient rich feed materials.

INTRODUCTION:

Earthworms are soil invertebrates that play a key role in recycling organic matter in soils and also called as "Ecosystem Engineers". An earthworm improves the soil mix by helping it to achieve the proper air, water and increases the soils ability to absorb water. Earthworms are reported to enhance microbial activities by providing in their gut contain favourable physio-chemical conditions like neutral pH, high moisture and temperature in the intestine and the mucus consisting of energetic and easily metabolizable compounds. Earthworms play a major role in causing changes in soil microbial community and promote microbial activity during the decomposition of organic matter.

Earthworms seem to have poor proper enzymatic systems and they appear to rely upon the ingested micro-organisms to degrade soil organic matter. The earthworms and the microorganisms act symbiotically to accelerate and enhance the decomposition of the organic matter. The activity of microbes present in the gut of the earthworms as well as that present in the wastes might jointly intensify the decomposition process. (Cortez and Bouch., 1998)

Thus, the present study is an attempt to explore the gut associated microbes in earthworm *E. fetida* during vermicomposting process. This study is aimed specifically at Enumerating the microbial load (CFU$\times$10X) in mid gut and fresh vermicompost of earthworm specie *Eisenia fetida.*

MATERIALS AND METHODS :

Earthworm are collected from farms, identified and reared in Brick bed containers (50x35x35 cm) containing 5kg of feed material at 28 ± 2^0C, 75% moisture and 80% relative humidity. Earthworms (*E.fetida*) were collected from vermicomposting unit of our college, were washed with sterilized water and placed in sterile petri dish with moistened filter paper for 24 hours. They were then wash externally with 70 % ethanol and dissected out mid-gut region, weighed and homogenized in 0.85% NaCl solution.

Isolation of microflora was done by serial dilution method. For this, mid-gut of earthworm was excised and gut content (1gram) was suspended

in 10 ml sterile 0.85 % NaCl solution, which is then serially diluted (10^{-1} to 10^{-7}). After serial dilution 0.1 ml solution was taken from 10^{-3} to 10^{-6} diluted tube by using sterile micropipette and plated on nutrient agar medium. Plates were then incubated at 28^{0C} for 24 hours. Three replicates were maintained for each dilution.

RESULT & DISCUSSION:

The numbers of fungi and bacteria present in the gut of vermicomposting earthworm *E. fetida* is influence by the richness of feed material as well as the duration of culturing. Whether the microbes observed in earthworm guts are permanent residents of the gut or are transient reflections of the microbial community on feed material is not yet clear. Increase in bacterial abundance in the gut passage indicates that gut stimulates the bacterial multiplication; this may be due to increased fragmentation of feed materials and accompanying nutrient accessibility or may be due to release of labile substrate by the gut during fragmentation of organic matter.

In this study, bacterial population seems to exponentially increase as the duration of culturing on rich feed material increases, indicating stimulatory effect of gut processes on the bacterial population. Such exponential increase is not seen in case of fungi or actinomycetes indicating that fungal and actinomycetes populations are mere transient reflection of feed material microbial community. Earthworms themselves have no intrinsic capacity to digest cellulose and hemicellulose and depend on microorganisms as a source of essential amino acids. So soil enrichment is a cumulative effect of earthworm and gut microorganisms. In the present study, we try to enumerate the gut microbes, further analysis and identification of microbes is needed to ascertain their role in soil enrichment.

CONCLUSION :

The present study were analyse the bacterial and fungal population is in the gut of composting earthworm *E. fetida*. Result indicates bacteria constitute 12 ± 0.58 (CFU× 10^7 /g) followed by fungi 8 ± 0.33(CFU× 10^3 /g) and actinomycetes 4 ± 0.33(CFU× 10^3 /g). Fresh cast contains 26 ± 1.45 (CFU× 10^7 /g) bacteria, 13 ± 1.15 (CFU× 10^3 /g) fungi and 10 ± 0.88 (CFU× 10^3 /g). Microbial population is more in cast due to rich in nutrients and large surface area available for growth and reproduction of microbes. Microbial population seems to be depending on type of feed material and increased significantly when reared in nutrient rich feed materials.

REFERENCES:

Mohamed O. Albasa., P. Gupta., P.W. Ramteke., 2014. Isolation of Microflora in earthworms guts from different substrates. *American Journal of Agriculture and forestry*. August 20, 2014, 2 (4) 206-208.

K.Parthsarthi., L. S. Ranganathan., V. Anandi., Josef Zeyer., 2004. Diversity of microflora in the gut and casts of tropical composting earthworms reared on different substrate. *Journal of Environmental Biology*. 28 (1) 87-97, January 2007.

M.A. McLean., S. Migge-Kleian., D. Parkinson. Earthworm invasions of ecosystems devoid of earthworms: effects on soil microbes. *Biol Invasions*., 8:1257-1273, (2006).

Boris A. Byzov., Nikita V. Khomyakov., Sergei A. Kharin., Alexander V. Kurakov,. Fate of soil bacteria and fungi in the gut of earthworms. *European Journal of Soil Biology*. 43, S149-S156 (2007).

Edwards, C.A. and K.E. Fletcher,. Interactions between earthworms and microorganisms in organic-matter

breakdown. *Agric. Ecosyst. Environ.* 24: 235-247, (1988).

Lee, K.E., Some trends and opportunities in earthworm research or: Darwins children- the future of our discipline. *Soil. Biol. Biochem.* 24: 1765-1771, (1992).

Dominguez, J., State of the art and new perspectives in vermicomposting research. In: Edwards, CA (Ed.), Earthworm Ecology. 2 ed. CRC Press, Boca Raton. pp: 401-425.

Table 1. Microbial population in the mid-gut of earthworm species, *Eisenia fetida* reared for 60 days.

Microbes	Initial 1st day	Mid 30th day	Final 60th day
Bacteria (CFU× 10^7 /g)	12 ± 0.58 (0)	36 ± 3.18 (200)	74 ± 1.45 (517)
Fungi (CFU× 10^3 /g)	8 ± 0.33 (0)	14 ± 1.73 (75)	20 ± 1.15 (300)
Actinomycetes (CFU× 10^3 /g)	4 ± 0.33 (0)	12 ± 0.67 (200)	15 ± 0.58 (275)

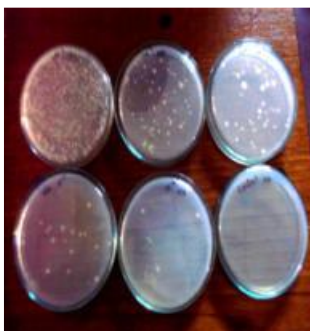Each value is the mean (X ± SE) of three observations.
Values within parenthesis indicate the percentage of change from initial value.

Table 2. Microbial population in fresh vermicompost of earthworm species, *Eisenia fetida* for 60 days.
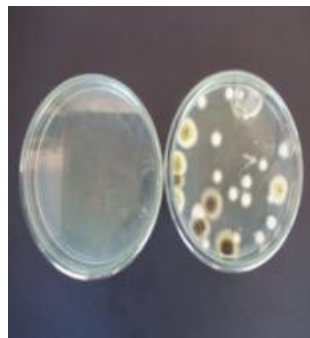
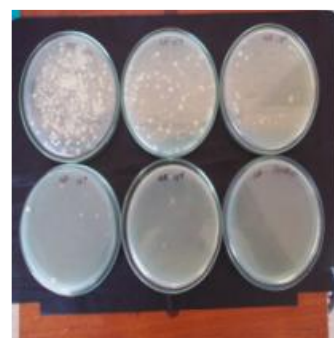| Microbes	Initial 1st day	Mid 30th day	Final 60th day
Bacteria (CFU× 10^7/g)	26 ± 1.45 (0)	51 ± 1.20 (96)	89 ± 2.33 (242)
Fungi (CFU× 10^3 /g)	13 ± 1.15 (0)	23 ± 0.88 (92)	30 ± 1.53 (162)
Actinomycetes (CFU× 10^3 /g)	10 ± 0.88 (0)	12 ± 0.67 (20)	15 ± 0.67 (70)

Each value is the mean (X ± SE) of three observations.
Values within parenthesis indicate the percentage of change from initial value.

(1) **(2)** **(3)**