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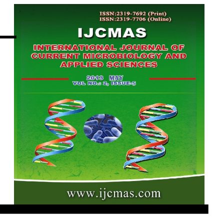

Original Research Article

Enumeration of bacterial population in the gut region of *Eudrilus eugeniae*

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Keywords

Earthworm gut;
Bacterial population;
Eudrilus eugeniae.

A B S T R A C T

In soils, organic matter decomposition and stabilization largely occur as a result of microbial activity, although when present, earthworms are important drivers of the processes through their interactions with microflora which begin during organic matter digestion by earthworms. Here, the diversity of bacteria, fungi and actinomycetes were analysed in the gut of *Eudrilus eugeniae*. The bacterial population was more in the midgut than foregut and hindgut region.

Introduction

Few soil ecology studies are focused on the prospects of linking microbes and fauna (Brown *et al*., 2004; Coleman *et al*., 2004). Without doubt, earthworms are the most important soil invertebrates in the soil ecosystem in terms of biomass and activity (Rombke *et al*., 2005), being often considered as ecosystem engineers (Lavelle, 1988). Moreover, soil contains a large diversity of microorganisms (Torsvik *et al*., 2002). Earthworms are important drivers of soil biogeochemical processes as they modify soil physicochemical properties and microbial communities by feeding, burrowing and casting activities (Edwards, 2004). Decomposition and humification of biodegradable organic waste materials is predominantly carried out by microorganisms in the soil but the few recent studies have shown that earthworms too have roles in humification (Edwards and Bohlen, 1996; Manivannan *et al*., 2004; Ranganathan and Parthasarathi, 2005). The composition of micro flora in the earthworm gut varies depending on the species of earthworm studied, season and feeding regime of the earthworm (Kristufek *et al*., 1992). Parthasarathi *et al*., (2007) showed that the number of microorganisms present in the gut of earthworm depended on the substrate that the earthworm fed on soil, and either no changes or higher numbers in earthworms fed on decomposed leaves, than in earthworms fed on inert substrate.

Earthworms indirectly influence the dynamics of soil chemical processes, by comminuting the litter and affecting the activity of the soil micro-flora (Petersen and Luxton 1982; Lee 1985; Edwards and Bohlen 1996). Interactions between earthworms and microorganisms seem to be complex. Earthworms are reported to have association with such free living soil bacteria and constitute the drilosphere (Ismail 1995). In this way, it is known that microbial biomass and activity are usually enhanced in the drilosphere, with greater numbers of microbial colony forming units (CFUs) in the burrow walls and earthworm casts than in the parent soil (Aira *et al*, 2007).

Materials and Methods

The laboratory experiment was conducted at the Department of Zoology, Sri Parasakthi College for Women, Courtallam, during the year 2011-2012. The enumeration of the total bacteria in vermicomposts samples was carried out by following "serial dilution plate count technique" (Martin, 1950) using nutrient agar for bacteria. The population of microbes was examined in various treatments and expressed as cfu/ml.

The experiment was laid out in a Completely Randomized Factorial Block Design with food substrates as the main factor and earthworm species as the sub factor. Two substrates were used and each treatment was replicated thrice. The population of bacteria was examined in various treatments and expressed as CFU/ml (Meenatchi *et al.*, 2009).

Results and Discussion

The total bacterial population in foregut, midgut, and hindgut of *E.eugeniae* was enumerated in cowdung and leaf litter wastes vermicompost. The bacterial count increased by the end of the experiment (Table 1). The bacterial populations were higher in the midgut region than in the foregut and hindgut region. The selective activity of the gut fluid of earthworms could be a significant factor for the animal's nutrition as well as for regulating the steady state of the intestinal microbial community, and modification of microbial communities in soil (Byzov *et al*., 2007).

Idowu *et al.*, (2006) reported that the aerobic bacterial counts in midgut of the earthworm, *Libyodrillus violaceous* was higher than that of foregut whereas the hindgut region recorded maximum. This incorborates with the findings of the researchers proving that earthworms include microorganisms in their substrates as a food source and can digest them selectively (Edwards and Bohlen, 1996); (Bohlen and Edwards, 1995). Similar increases in microbial population were reported in other vermicomposting systems also (Suthar, 2010c; Prakash and Karmegam, 2010). Similar type of result was also obtained in our present study.

In the present study, midgut of *E.eugeniae* showed higher bacterial counts than foregut and hindgut. The results indicated that the organic substrates used in the present study could initiate the proliferation of the microorganisms and the earthworm species used in the present study also acted as an organic nutrient for the rapid bacterial colonization whereby increases the microbial activity. The statistical analysis of "t" test of bacterial count of all treatments shows significance at 5% level ($p \leq 0.05$).

Table. 1 Total Bacterial populations in the gut of *E.eugeniae* cultured in different vermicompost (cowdung and leaf litter wastes) for 60 days

Bacterial population	**Total Bacterial population in the gut of *Eudrilus eugeniae* Bacteria (CFUx$10^7 g^{-1}$)**					
	Foregut		**Midgut**		**Hindgut**	
	Initial	Final	Initial	Final	Initial	Final
Control	292.33±2.08	314.67±5.34	368±3.79	426.0±2.04	312.67±3.79	320.67±1.67
Vermicompost 1	284.67±1.86	336.67±1.86	366±3.18	381.33±0.82	112.0±3.06	10.15± 1.02
Vermicompost 2	316.0±2.91	343.33±3.93	382±7.89	438.67±4.08	348.33±3.71	362.0±3.71

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