Journal of Tropical Agriculture 35 (1997) : 68-70

MICROFLORA ASSOCIATED WITH EARTHWORMS AND VERMICOMPOST

Earthworms play an important role in enriching the soil with organic matter (Darley, 1961; Gupta and Sakal, 1967). This ability is being exploited now a days for the production of vermicompost. It is a product of combined activity of **earthworms** and various soil microorganisms. In the present investigation, the microflora associated with an exotic and local species of earthworm, namely, *Eudrilus eugeniae* Kinberg and *Megascolex* sp. in relation to that of vermicompost produced by these species and ordinary compost were studied by serial dilution and plating technique of Timonin (1940). The following media such as compost extract agar, Martin's rose bengal agar (Martin, 1950) and Himedia and Jensen's nitrogen free medium (Jensen, 1948) were used for the isolation of bacteria, fungi, actinomycetes and ***Azotobacter*** sp. respectively.

The surface and gut microflora of earthworms were enumerated by using healthy adult worms of both exotic as well as the native species. Each replication consisted of only one earthworm. The surface microflora was estimated by washing gently each earthworms in 5 ml of sterile water for 5 minutes and plating the resultant supernatant after serial dilution to the extent of 10^3 for *Azotobacter* sp., 10^4 for fungi, 10^6 for actinomycetes and 10^7 for bacteria in their respective media. The surface washed earthworms were separated and killed by brief exposure to 95% ethanol. The hind gut of each worm was dissected aseptically and the gut contents were carefully transferred to 9 ml of sterile water blanks. After serial dilution these were plated on appropriate media by the method described above. The microflora of compost were also studied by this procedure using 1g each of **vermicompost** and ordinary compost. The plates were incubated at $28 \pm 2^{\circ}C$ for 2 days for bacteria, 4 days for fungi and 7 days for actinomycetes and *Azotobacter* sp. Three replications were maintained for each treatment. The final data are expressed in terms of number of microorganisms present per earthworm for surface wash and on per gram basis for gut microflora, microflora of vermicompost and ordinary compost.

More number of fungi (22.7×10^4) and actinomycetes (8.3×10^6) could be isolated from the surface wash of exotic species of earthworm. But the number of bacteria (1.6×10^7) and **Azotobacter** sp. (3.0×10^3) present was higher in the local species of earthworm (Table 1). The total number of different microorganisms was however uniformly higher in the gut content *of Eudrilus eugeniae.* Here, the population density was in the order of 20.5×10^7 for bacteria, 223×10^4 for fungi, 94.7×10^6 for actinomycetes and 1.3×10^3 for *Azotobacter* sp. The presence of large number of microorganisms including nitrogen fixing bacteria as surface and gut microflora of earthworms has been reported earlier by Hutchinson and Kamel (1956), Khambata and Bhat (1957), Parle (1963), Citernesi *el al.* (1977) and Contreras (1980). The native soil **microflora** can greatly influence the type of microorganisms associated with **earthworms.** Some of these organisms will get entrapped in the outer viscous layer of earthworms and form a part of the surface microflora. Both soil and plant litter partially decomposed by various microorganisms are important sources of gut microflora. Some of these organisms which survive the digestive process will persist as the gut microflora of these annelids. However, there is no report as such to indicate any specific association between microorganisms and a particular species of earthworm. In the present study also, it was observed that most of the bacteria and fungi isolated from the two species of **earthworms** either from their surface or gut contents were of common occurrence. While the $Gram^+$ bacteria belonged to *Bacillux* sp., the fungi were *Mucor* sp., *Aspergillus* sp., *A. flavus, A. niger, Fusarium* sp. *Penicillium* sp. and *Trichoderma* species.

Vermicompost produced by *E. eugeniae* had a higher population of bacteria (5.7×10^7), fungi (22.7×10^4) and actinomycetes (17.7×10^6) when compared to that of ordinary compost

Table 1. Microbial population* of earthworms, vermicompost and compost

Sample	Bacteria, 10^7	Fungi, 10^4	Actinomycetes, 10^6	Azotobacter, 10^3
A. Surface wash (number / worm)				
1. *E. eugeniae*	1.3.	22.7	8.3	0.7
2. Megascolex sp.	1.6	13.3	1.0	3.0
B. Gut (number / g)				
1. *E. eugeniae*	20.5	223.3	94.7	1.3
2. Megascolex sp.	2.9	88.7	19.3	-
C. Vermicompost (number / g)				
1. *E. eugeniae*	5.7	22.7	17.7	2.3
2. Megascolex sp.	2.0	4.3	1.0	-
D. Ordinary compost (number / g)	2.6	4.0	4.3	0.3

* Mean of three replications

and vermicompost produced by *Megascolex* sp. The exotic species also had a higher population of microorganisms particularly in its gut content. This may be one of the factors responsible for the rapid composting ability of *E. eugeniae*. The possibility of using some of the beneficial microorganisms associated with earthworms especially the nitrogen fixing bacteria and phosphate solubilising microorganisms for post enrichment of vermicompost has to be investigated further.

College of Agriculture,
Vellayani 695 522, Trivandrum Kerala

S. K. Nair, A. Naseema, K. S. Meenakumari
P. Prabhakumari, C. K. Peethambaran

REFERENCES

Barley, K. P. 1961. The abundance of earthworms in agricultural lands and their possible significance in Agriculture. *Adv. Agron.* 13 : 249-268

Citernesi, U., Nagilia, R., Seritti, A., Lepidi, A. A., Fillipi, C., Bagnoli, G., Neuti, M. P. and Galluzzi, R. 1977. Nitrogen fixation in the gastro-enteric cavity of soil animals. *Soil Biol. Biochem.* 9 : 71-72

Contreras, E., 1980. Studies on the intestinal actinomycete flora of *Eisenia lucens (Annelida oligochaeta). Pedobiologia* 20 :411-416

Gupta, M. L. and Sakal, R. 1967. The role of earthworms in the availability of nutrients in garden and cultivated soil. *J. Indian Soc. Soil Sci.* 15 : 149-151

Hutchinson, S. A. and Kamel, M. 1956. The effects of earthworms on the. dispersal of soil fungi. *J. Soil Sci.* 7 : 213-218

Jensen, H. L., 1948. The influence of molybdenum, calcium and agar on nitrogen fixation by *Azotobacter indicum*. *Proc. Linn. Soc. N. S. Wales*. 72 : 299-310

Khambata, S. P. and Bhat, J. V. 1957. A continuation to the study of the intestinal microflora of Indian earthworms. *Arch. Mikrobiol.* 28 : 69-80

Martin, J. P., 1950. Use of acid rose bengal and streptomycin in the plate method for estimating soil fungi. *Soil Sci.* 69 : 215-233

Parle, J. N. 1963. Microorganisms in the intestine of earthworms. *J. gen. Microbiol.* : 215-233

Timonin, M. I., 1940. The interaction of higher plants and soil microorganisms. I. Microbial population of rhizosphere of seedlings of certain cultivated plants. *Can. J.* Res. 18 : 307-317