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Microbiological and physico-chemical analysis of vermiwash of *Eudrilus eugineae* and *Eisenia foetida*

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The present work was carried out to study the microbiological and physico-chemical analysis of vermiwash of *Eudrilus eugineae* and *Eisenia foetida*. The vermiwash set up is made in the earthen pots. Pre-decomposed vegetable wastes along with cowdung (1:1 ratio) are filled in earthern pots and composted with two earthworm species, *E. eugineae* and *E. foetida* individually. The vermiwash is collected at every 5 days intervals upto 15 days and it is subjected to various assays. Microbiological studies of vermiwash revealed the presence of higher number of bactteria and actinomycetes. The decrease of pH, reduction of organic carbon and increase of electrical conductivity, phosphorous, potassium and sodium in vermiwash in treatments were found to be significant due to the earthworm activity.

Key words: Vermiwash, *Eudrillus eugineae*, *Eisenia foetida*, bacteria and actinomycetes.

INTRODUCTION

Earthworms are a group of soil fauna and derive their nutrients from the decomposing organic matter. The role of earthworm in soil formation and soil fertility is well documented and recognized (Kale, 1998, Lalithe et al., 2000 and Ismail, 2005). Vermicompost usually contains higher levels of most of the mineral elements, which are in available forms than the parent material (Edwards and Bholan, 1996). Vermiwash, a foliar spray, is a liquid fertilizer collected after the passage of water through a column of worm activation. It is a collection of excretory and Secretory production of earthworms, along with the major micronutrients of the soil and soil organic molecules that are useful for plants (Ismail, 1997).

Vermiwash seems to posses an inherent property of acting not only as a fertilizer but also as a mild biocide (Pramoth, 1995). Vermowash is attributed to better growth of plants and higher yields by slow release of nutrients for absorption by the application of organic inputs like vermicompust in combination with vermiwash (Singh and Sharma, 2002).

MATERIAL AND METHODS

The earthworms, *Eudrillus eugineae* and *Eisenia foetida* were separately mass multiplied using cowdung as the medium. Different vegetable wastes such as Raddish, Carrot, and Ladies finger, Bringal, Beans and Potato were collected from vegetable market, Dindigul District. The vegetable wastes are allowed to shade dry and chopped into pieces of 2-4 cm in size. The chopped substrate was taken in plastic troughs and sprinkled with water. It is pre-decomposed for 15 days and this serves as the substrate for vermiwash production with different treatments as follows:

Pre-decomposed material of different vegetable wastes were mixed with cowdung in 1:1 ratio and allowed to stabilized far 5 days and it is filled in earthern pots. Pots were separately introduced with adult clitellate earthworms of *E.*eugineae (i.e., T1 and T2) and *E. foetida* (I.e., T3 and T4). The pot without earthworm is served as control (T0).

The moisture content of vermibed was maintained at 60 – 80 % by sprinkling water. The

The design of the vermiwash production

Treatment Number	Treatment employed	Earthworms particulars
T0	Cowdung (control)	-
T1	Cowdung	*Eudrillus eugineae*
T2	Cowdung + vegetable wastes	*Eudrillus eugineae*
T3	Cowdung	*Eisenia foetida*
T4	Cowdung + vegetable waste	*Eisenia foetida*

vermiwash from the various treatments and in the control were collected at every 5 days upto 15 days and enumerated the total colony forming units of bacteria and actinomucetes (Cappuuino, 1996). pH and electrical conductivity (Jackson, 1973), Total organic carbon (Walkly and Black Method, 1947), Total Phosphorous (Olson et al., 1954), Sodium and Potassium (Tandin, 1993) were also analyed for vermiwash.

RESULTS AND DISCUSSION

The total colony forming units of bacteria and actinomycetes were enumerated from the vermiwash of different treatments and it was recorded in the Table 1. A higher bacterial and actinomycetes load were found to be present in treatments T2, i.e., cowdung + *E.*eugineae (Table 1). A gradual decrease in the pH from the alkaline condition to neutral condition was observed in vermiwash of all the treatments (Table -2). This results well correlates with the work done by Daniel and Karmegam, (2000) who have observed a decreases in pH value in various organic materials composted using *E. eugineae* and *E. foetida*. A better reduction of pH was noticed in treatments T2 i.e., cowdung treatred with *E.*eugineae and T4 (i.e., cowdung treated with *E. foetida* (Table 2). Vermiwash of different treatments showed a significant increase in EC (Table-3). The similar kind of results was observed in the composts by various researchers. Bhiday (1994) reported significant increase in EC indicates the presences of soluble salts in the final compost, the EC increases from its initial values because the earthworms convert the unavailable form of nutrients into available form. The better reduction of organic carbon is observed in treatment T2 i.e., cowdung + vegetable wastes + *E. eugineae* (Table -4). The organic carbon reduction was supported by Crowford (1983). While a significant increase of total phophorus was observed in vermiwash of T2 treatment (Table -4). Lee (1991) observed the increase of phosphorous content during vermicoposting is due to the earthworm gut derived phosphotase activity and increased microbial activity. The analysis of Sodium and Potassium in vermiwash of different treatments showed a significant increase in T2 teatement (Table T5 to T7).

Table 1: The total colony forming units of bacteria and actinomucetes in vermiwash of different treatements(15 d)

Treatment	Mirobial Population (cfu g^{-1})	
No	Bateria (x10^6)	Actinomycetes (x10^3)
T0	2.27	10.90
T1	6.72	15.45
T2	12.27	18.63
T3	5.63	11.81
T4	8.27	13.27

Table 2: Changes of pH observed in vermiwash of various treatments at different intervals

Treatments	pH of vermiwash			
No	0d	5d	10d	15d
T0	9.0	8.8	8.5	8.0
T1	9.0	8.5	8.2	7.8
T2	9.0	8.4	7.7	7.2
T3	9.0	8.7	8.3	7.9
T4	9.0	8.4	7.9	7.5

Table 3: Changes of Electrical Conductivity (EC) in vermiwash of different treatments at different intervals

Treatment	Electical Conductivity(x 10^2 dsm^{-1})			
No	0 d	5 d	10 d	15 d
T0	0.9	1.1	1.5	1.9
T1	0.9	1.6	2.4	2.9
T2	0.9	2.3	2.9	3.8
T3	0.9	1.4	2.1	2.6
T4	0.9	2.1	2.9	3.5

Table 4: Changes in organic carbon and total phophorus contents in vermiwash of different treatments (15 d)

TreatmentNo	Total organiccarbon (%)	Total organic Phosphorous (mg g^{-1})
T0	19.7	1.38
T1	15.17	1.89
T2	13.27	2.37
T3	16.7	1.97
T4	14.50	2.24

Table 6: Changes in total sodium content in vermiwash of different treatments at different intervals

Treatment	Total sodium (meq)			
No	0 d	5 d	10 d	15 d
T0	2.02	2.12	2.89	3.26
T1	2.02	3.19	4.52	4.57
T2	2.02	3.24	4.81	4.88
T3	2.02	2.94	3.05	3.89
T4	2.02	3.14	3.88	4.39

Table 7: Changes in total potassium in vermiwash of different treatments at different intervals

Treatment	Total potassium (meq)			
No	0 d	5 d	10 d	15 d
T0	1.72	2.12	2.89	3.09
T1	1.72	2.90	3.15	3.89
T2	1.72	3.45	4.81	4.88
T3	1.72	2.79	3.13	4.00
T4	1.72	3.24	4.38	4.52

CONCLUSION

Based on the study it was concluded that the significant increase of total microbial population, EC, phosphorus, potassium and sodium and significant reduction of organic carbon and pH makes the vermiwash produced from *E.*eugineae and *E. foetida* as alternate liquid manure for rural application.

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