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EFFICIENCY OF DIFFERENT EXTRACTION METHODS FOR THE MACRO-FAUNA OF HOUSEHOLD BIOCOMPOST

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ABSTRACT

The household biocompost provides food and shelter to many micro and macro organisms. Among these, macro-fauna of the compost acts conspicuously but is not given much attention, besides work on earthworms. To study the role of macro fauna, one has to extract it from compost. However, at present there are no standard methods available for the extraction of this compost macro-fauna. Hence, the methods used for extraction of soil organisms were modified and used in this study. The study revealed that among all the methods, the hand sorting method, though tedious, extracted majority of organisms (69.2%) compared to direct microscopic observations, Ladell's modified method (1936) and Sait and Hollick method (1944).

Key words : Household biocompost, Macro-fauna, Extraction methods

INTRODUCTION

Compost acts as a separate ecosystem housing many small big organisms. Hence, it becomes essential to find out these organisms to know their contribution. These organisms can be categorized as microflora and fauna and macro flora and fauna. The micro flora mainly includes different kinds of bacteria, fungi and macro flora constitutes of bracket fungi and mushrooms. While micro fauna include nematodes, protozoa, macro fauna comprise diverse organisms of various shapes and sizes right from tiny mites to large beetles and bulky worms. In order to understand the decomposition process within an ecosystem, it is essential to assess the populations of these groups (Singh & Singh 1978).

The micro fauna has been studied extensively by Indian and well as international scholars (Gaiind & Pandey 2006; Wei *et al* 2007; Kumar *et al* 2008). Among macro fauna, mostly the earthworms are studied (Gajalakshmi *et al* 2000; Kaviraj & Sharma 2003; Lourdraj 2006). However, except for few references like

Hazra *et al* (1999) from India and Lundberg and Persson (1973) and Odegard and Tommeras (2000) from Europe, not much work seems to be done to explore macro fauna of the compost. They are not studied and hence there are not any standard methods provided to find out macro organisms in the compost. A lot of literature is available on extraction of soil arthropod fauna but they can not be directly used for extraction of fauna from compost as it contains organic matter in higher contents. Hence standard methods were studied and modified as per the need to extract and enlist the macro-organisms in the compost. For the study, six household compost samples from Thane were studied for 14 months using modified extraction methods.

MATERIALS AND METHODS

There are two principal methods of extraction as described by Murphy (1962) - Mechanical methods- In this method, animals are physically separated from the soil e.g. Hand sorting, Flotation methods. In the case of another method (Dynamic method), the animals are driven from the soil. e.g. Funnel methods, Use of High gradient extractors. Among the mechanical methods, hand sorting and direct microscopic observations methods were found to be efficient, whereas from flotation methods, Ladell's modified method (1936) and Salt and Hollick method (1944), gave satisfactory results hence were used for the extraction in the present study.

a) Hand sorting: In this method, a known quantity of compost sample (100 g) was taken in a Petri dish and observed with naked eyes. The organisms were picked up using forceps and assorted organisms were then directly preserved in the standard insect preservative i.e. a mixture of alcohol and glycerine [70:30]. The collected animals were counted by simple counting methods.

b) Direct microscopic observations: In this method, a known quantity of the compost sample (100 g) was taken in a Petri dish and it was observed under stereoscopic microscope (Make Lawrence & Mayo, 10X x 4X magnification). The eggs, larvae and other small invertebrates found were preserved in the insect preservative i.e. a mixture of alcohol and glycerine [70:30] using forceps.

c) Flotation method: Two flotation methods were used for extraction of soil fauna viz. Ladell's modified method (1936) and Salt and Hollick's method (1944).

i) Ladell's modified method (1936): A mixture of 200 ml of 5% of $MgSO_4$ solution and 400 ml of distilled water was poured over a compost sample in a large glass trough. The mixture was then agitated with air current for few minutes. After the mixture settled down, the dead organisms, which floated atop, were removed with forceps.

Solution of $MgSO_4$ was used as it breaks down the soil particles, releasing the organisms trapped inside (Edwards & Fletcher 1971). After it comes in contact with the agitated water, the narcotized or dead organisms float on the top of the mixture. Air current is used in this method to circulate the water thoroughly so that all the organisms come on the water surface.

ii) Salt and Hollick method (1944): In this method, organic compound like benzene/ toluene was used as the surface acting reagent. Benzene / toluene was poured over the mixture of $MgSO_4$ solution + water + compost and later agitated with air current. After settling, the organisms were removed using forceps.

Benzene/ toluene when added to the mixture, forms a thin film on the surface. The floating organisms on the water surface were captured and later picked up by forceps. After treating with the $MgSO_4$ solution, smaller organisms like springtails escape from the compost particles; come on the top and try to escape. But after pouring benzene/toluene over this mixture, they get trapped in this layer and can be easily collected.

RESULT AND DISCUSSION

There is no single method, which is 100 percent efficient to extract all the organisms from the compost. Hence, the record was maintained for all the methods used, and efficiency of these methods were compared. The efficiency of any method for extracting organisms can be judged by actually comparing number of organisms extracted.

When the average of number of organisms extracted from different techniques (Table 1), it was observed that, Hand sorting method though was more laborious, extracted majority of organisms (69.2%). In hand sorting method it was found to extract maximum number of nematode worms, woodlice, beetles, flies, cockroaches, ants, centipedes/ millipedes, pseudoscorpions and snails.

Table 1 Comparison of efficiency of different extraction methods used

Animals \ Methods	Hand sorting (%)	Microscopic (%)	Ladell (%)	Salt and Hollick (%)
Nematode worms	26.85	23.49	24.88	24.75
Annelid worms	28.57	28.57	28.57	14.28
Woodlouse	29.06	19.04	28.03	24.77
Beetles	33.47	22.19	23.43	20.31
Flies/maggots	28.00	22.75	27.08	22.14
Ants	46.15	19.23	7.69	26.92
Earwigs	26.15	20.23	26.53	27.06
Cockroaches	66.66	-	33.33	-
Springtails	21.92	18.49	30.11	29.46
Centipedes/millipedes	43.94	22.93	19.13	20.98
Mites	23.8	23.76	23.79	24.07
Pseudoscorpions	30.82	21.16	29.08	18.9
Snails	31.14	29.45	25.78	23.42

Salt and Hollick method ranked second after hand sorting (15.4%). It extracted maximum number of earwigs and mites. Although it was fairly good for extracting nematodes, woodlice, ants and centipedes/millipedes, it was least useful for annelid worms, beetles and flies.

Only springtails were extracted more efficiently by Ladell's method. This method extracted 7.7% of all the organisms so it was third among the four methods. But the same method was found to be least effective for extraction of ants and centipedes/millipedes. Microscopic method could not give best results for any particular group of organisms, but it was second efficient method of extraction for annelid worms and snails. However, among all mechanical and dynamic methods of extraction used, the hand sorting method gave best results for majority of the invertebrates. The above results also depict that any one method is not hundred percent efficient for sorting out all groups of animals and hence for maximum extraction of animals to record the correct density, all the methods should be used.

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