



ISOLATION OF BACTERIAL AND FUNGAL CULTURES FOR EFFECTIVE AEROBIC COMPOSTING OF MUNICIPAL SOLID WASTE

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ABSTRACT: Municipal Solid Waste today poses a significant threat to the environment. In developing nations MSW treatment process are not well developed and traditional dumping practices are adopted for waste management. This paper investigates possibility of employing selected and defined microbial culture consortium to carry rapid and controlled composting of the biodegradable portion of MSW. The consortium consisted of one thermophilic bacteria, one mesophilic bacteria, one thermophilic fungus and one mesophilic fungus. The selected consortium was found to be capable of carrying out aerobic decomposition within a period of 25 days, and has generated a good quality humus which has got potential applications in agriculture and forestry as a soil rejuvenator.

KEYWORDS: Municipal Solid Waste, Microbial Consortium, Composting, Soil rejuvenator, humus.

INTRODUCTION:

The developing world today faces a problem of massive increase in the loads of municipal Solid Waste. The Municipal Solid Waste Management (MSWM) is one of the critical environmental challenges of rapid urban development facing the developing countries including India. Growing populations and rapid

developments have resulted in increase in quantity and variety of solid waste. [1, 2]. Based on the nature the waste could be broadly classified as biodegradable and non-biodegradable. The biodegradable fraction of the MSW is very much detrimental to the surrounding environment due to its possibilities of yielding highly toxic species of chemicals.

Composting process has been developed for many reasons such as, higher decomposition rates and lower stabilization time, odorless conditions and producing higher temperatures resulted to higher safety from the point of view of pathogen and parasite destruction [3]. The composting process practiced today utilize the inbuilt or native flora for the purpose, very little efforts have been taken towards using any cultural amendments or consortia to carry out the composting. Some efforts with respect to use of microbial amendments in the composting process have been taken [4]. Although the present practice is satisfactory with respect to effective disposal of the solid waste, but it requires about 8 to 10 weeks for completion.

Hudson [5,6] described succession in aerobic process, noting that the composition of active microflora of the composting waste from predominantly mesophilic in the early stages of thermogenesis to one of predominantly

thermophiles at peak of the heating cycle. He identified the mesophilic *Cladosporium herbarium*, *Aureobasidium sp.*, *Alternaria sp.* and *Epicoccum purpurascens* at the beginning of composting process. Hamer suggested that unlike microbially mediated production processes, microbially mediated environmental protection and restoration processes involve process cultures comprising multiple microbial consortia.[8,9,10]

MATERIALS AND METHOD:

Enzymatic studies:

The soil samples were assessed for enzyme activity for enzymes like amylase, lipase, xylanase, protease etc. Standard enzymatic assay methods were adopted for this purpose. Analysis was separately carried for mesophilic, thermophilic bacteria and fungi [2,3].

RESULT AND DISCUSSION:

The results for the assays were tabulated in table 1. On the basis of assay results cultures showing maximum activity for all the enzymes studied were finally selected and identified. Bacterial cultures were identified using rDNA analysis whereas fungal identification was done by microscopic analysis.

Finally identified and selected cultures are listed in table 2.

Table 2.: Enzymatic assay of the selected isoate

Culture		A	P	L	X	
Bacteria	Mesophilic	BM1	6.2	1.1	2.2	4.8
		BM2	5.8	1.0	2.1	4.5
		BM3	6.0	1.7	2.1	5.2
		BM4	5.2	0.9	1.9	4.9
		BM5	5.9	1.3	1.6	5.2
	Thermophilic	BT1	6.0	0.8	1.5	4.3
		BT2	6.1	1.4	1.9	4.9
		BT3	5.2	1.0	1.3	4.8
		BT4	5.9	0.7	1.4	4.7
	Fungi	Mesophilic	FM1	6.5	1.6	2.0
FM2			6.1	1.2	2.0	5.1
FM3			6.6	1.3	1.8	4.9
FM4			5.0	0.8	1.8	5.0
Thermophilic		FT1	4.1	1.2	1.5	5.0
		FT2	6.2	1.2	1.6	5.3
		FT3	5.1	0.7	1.1	4.3

Table 3.: Finally isolated cultures for composting

Bacteria	Mesophilic	<i>Bacillus spp.</i>
	Thermophilic	<i>Bacillus stearothermophilus</i>
Fungi	Mesophilic	<i>Aspergillus niger</i>
	Thermophilic	<i>Thermomyces lanuginosus</i>

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