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ENZYMATIC STUDIES ON THE ISOLATED FUNGAL AND BACTERIAL STRAINS FOR DEVELOPMENT OF MICROBIAL CONSORTIUM FOR BIOREMEDIATION OF MUNICIPAL SOLID WASTE

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ABSTRACT:

Agricultural wastes include the animal manure, leaves and other cellulosic materials, which increases the organic load of the solid waste, thereby causing delay in the natural degradation of the waste and development of more pollution factors like gases, etc. The present investigation focuses on characterization of enzymic properties of cultures to be opted as potential candidates for the development of beneficial microbial consortia for carrying out accelerated aerobic composting of the MSW. The results were quite promising and have shown significant values for certain cultures which can be used as a part of consortium.

KEYWORDS: Municipal Solid Waste, Beneficial Microbial Consortium, Aerobic composting, Temperature, bioremediation.

INTRODUCTION:

Now-a-days, Municipal Solid Waste and Domestic Waste Water is burning issue all over in India. Discharge of untreated/ partially treated sewage is a major source of water pollution. It contributes 80% of the pollution load. Demand of water supply, electricity and other basic amenities are stressing to the municipal authorities in Beed region. This stress is due to the increasing population day to day. We need to seriously consider about treatment of waste water generated because the same is going to be used by the downstream population as water source. Solid Waste Management is another burning issue in all over Maharashtra. Due to the mismanagement i.e. improper collection, transportation and disposal methods of solid waste leads to many environmental problems. Daily solid waste generation in Beed is about 50 metric tons. At present the Municipal council is collecting the municipal solid waste and disposing by the open dumping without treatment.

Agricultural wastes include the animal manure, leaves and other cellulosic materials, which increases the organic load of the solid waste, thereby causing delay in the natural degradation of the waste and development of more pollution factors like gases, etc.

MATERIAL AND METHODS:

Enzymatic characterization was done for the selected cultures with respect to following enzyme:

a. Cellulase Assay
b. Lignin Peroxidase assay
c. Xylanase assay
d. Phosphatase assay
e. Lipase Assay
f. Protease Assay
g. Urease Assay
h. α-Amylase Assay

Standard assay methods for the respective enzymes were used to assess the enzyme properties.

RESULTS AND DISCUSSION:

For development of microbial consortium Mesophilic and Thermophilic bacteria and fungus were separately isolated, using screening methods for various enzymes. The primary isolates were subjected to detailed enzymatic assays and final selection of the culture was done on the basis of aggregate maximum enzyme activity for all the enzymes. The details of enzyme assays are given in Tables 1-4. For mesophilic bacteria total 10 primary isolates were obtained, out these isolates, Isolate No. 2 has shown maximum activity for all the enzymes under study. For thermophilic bacteria 09 primary isolates were obtained, of which Isolate No. 6 showed maximum aggregate enzyme activity. For mesophilic fungi total 07 isolates were obtained, of these Isolate No. 5 showed maximum activity for all the enzymes under study. For thermophilic fungi total 06 isolates were obtained, of these Isolate No. 3 showed maximum activity for all the enzymes under study.

Table 1: Enzyme activities for screening of mesophilic bacterial isolates

Isolate	Enzyme Activities (Units/ml)							
	Cellulase	Lignin Peroxidase	Xylanase	Acid Phosphatase	Lipase	Protease	Urease	α-Amylase
1	5.3	2.1	2.2	0.8	10.2	4.3	27	11
2	**18.1**	**6.3**	**5.9**	**7.9**	**31.2**	**14.1**	**60.9**	**28.9**
3	11.2	2.1	2.8	2.1	10.1	4.2	23.1	11.3
4	1.5	1.4	3.2	4.9	11.4	6.3	34.4	21.3
5	1.0	1.4	1.3	1.0	2.7	2.9	41.2	19.9
6	1.2	0.9	1.1	3.3	11.2	4.1	23.4	11.7
7	11.5	2.1	0.6	1.9	12.3	3.9	69.4	9.3
8	10.7	3.0	4.8	1.0	13.2	3.6	58.1	3.5
9	3.1	0.9	1.9	0.9	7.2	2.2	21.9	2.1
10	4.9	0.5	1.1	0.6	6.1	1.2	11.3	5.1

Table 2: Enzyme activities for screening of thermophilic bacterial isolates

Isolate	Enzyme Activities (Units/ml)							
	Cellulase	Lignin Peroxidase	Xylanase	Acid Phosphatase	Lipase	Protease	Urease	α-Amylase
1	3.2	1.1	2.3	2.1	2.0	2.1	11.9	3.3
2	3.2	0.9	3.1	2.1	1.9	2.5	9.6	7.1
3	2.9	0.8	2.1	1.7	7.1	7.9	15.3	10.0
4	1.1	1.0	0	0	0	0	0	0
5	1.8	0.6	0	2.1	0	7.1	3.1	0
6	**15.5**	**5.1**	**5.3**	**8.1**	**30.1**	**13.1**	**59.1**	**21.9**
7	0	0	0.2	3.1	4.3	4.3	20.1	11.2
8	1.0	2.1	1.1	1.9	2.1	2.4	0	3.9
9	7.1	1.1	1.8	4.1	21.9	2.9	21.8	8.9

Table 3: Enzyme activities for screening of mesophilic fungal isolates

Isolate	Enzyme Activities (Units/ml)							
	Cellulase	Lignin Peroxidase	Xylanase	Acid Phosphatase	Lipase	Protease	Urease	α-Amylase
1	2.2	1.3	1.9	1.8	2.8	6.1	10.1	9.6
2	0	0	0	0	11.1	2.1	21.1	19.8
3	1.1	2.1	1.7	3.7	9.7	6.2	0	10.3
4	0	1.9	1.1	4.2	0	2.4	10.2	9.8
5	**16.2**	**5.1**	**4.7**	**6.9**	**21.1**	**10.9**	**47.3**	**26.1**
6	0	0	0	0	0	5.1	11.2	21.9
7	11.2	5.1	3.8	4.9	12.8	5.2	21.9	14.1

Table 4: Enzyme activities for screening of thermophilic fungal isolates

Isolate	Enzyme Activities (Units/ml)							
	Cellulase	Lignin Peroxidase	Xylanase	Acid Phosphatase	Lipase	Protease	Urease	α-Amylase
1	2.1	1.7	2.1	2.9	3.8	2.9	10.8	8.7
2	0	0	0	2.7	18.1	4.1	22.3	19.1
3	**16.3**	**5.1**	**6.8**	**8.2**	**33.2**	**15.8**	**49.9**	**29.1**
4	15.1	5.1	6.6	7.6	23.9	9.9	38.8	25.8
5	0	0	0	6.2	10.2	2.9	3.2	11.8
6	2.9	2.3	3.1	7.3	21.0	10.4	10.7	19.2

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