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Development of an Efficient Biodegradation System for Solid Waste Composting using Indigenous Microorganisms.

UNIVERSITY OF MORATUWA
MORATUWA

By

H.M.M.Herath

A thesis was submitted to the Department of Civil Engineering of the University of
Moratuwa in partial fulfillment of the requirements for the
Degree of Master of Philosophy (Research) in Solid Waste Management

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Research work supervised by
Mr. S. Pathinather
Dr S.C Wijerathne
Department of Civil Engineering
University of Moratuwa
Moratuwa
Sri Lanka

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University of Moratuwa



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Abstract.

This thesis describes a study conducted to produce compost using vegetable market garbage, as the main ingredient. The main objective was to reduce the time of production and to produce good quality compost by inoculation and aeration. Low cost windrow method was used under indoor environmental conditions where six different types of treatment were studied, each lasting eight weeks.

The experimental heap was 1.5m X 1.5m x 1m (length X width X height) and a hollow triangular wooden frame 1.5 m X 0.3m X 0.3m (length X width X height) was used to facilitate aeration. Initial weight of the feedstock was 250 kg and the heap was turned once a week. The first trial was carried out using 80% market garbage, 10% cow dung, 5% sawdust and 5% coir dust. For subsequent experiments the composition used was 50% market garbage, 10% cowdung 10% saw dust 5% coir dust and 25 % air-dried grass clippings. Mature compost 2.5 % and 5 % were used as inoculum in the third and fourth runs respectively. The fifth run was conducted without turning the heap and the sixth one without the frame for aeration and also without turning the heap.

Physical chemical and biological changes were determined during the composting process to evaluate the effectiveness of the process. Enzymatic activity of microorganisms, which were active during the composting process, was also studied. Seed germination in the final compost was tested by introducing *Raphanus* sp seeds.

The results indicated that a weight reduction of 50% occurred and the high temperature recorded during the initial stages helped to reduce pathogen and weeds. Diverse and dense indigenous beneficial microorganisms were present and macro organisms played an important role in reducing the particle size. Turning the windrows for aeration and addition of matured compost was found to accelerate the rate of composting. Use of 5% mature compost gave a higher rate of composting than 2.5%.

From determinations of temperature, C/N ratio CO₂ production, pH bulk density and seed germination it was concluded that when the process is properly controlled good quality compost can be obtained in about eight weeks.



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*This Thesis is dedicated to my loving
Father; it has been a greatest honour
being your daughter.*



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Declaration

The Thesis is a report of research work carried out in the Department of Civil Engineering, University of Moratuwa, Sri Lanka between March 2000 and March 2002. The work included in the thesis in part or whole has not been submitted for any other academic qualification at any institution.


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H.M.M. Herath


Department of Civil Engineering,

University of Moratuwa.



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UOM Verified Signature

 Mr. S Pathinather

Supervisor

University of Moratuwa.

UOM Verified Signature

Dr. S.C Wijerathne

Supervisor

University of Sri Jayewardenepura

