PRELIMINARY STUDIES ON MICROBIAL AND PHYSICO-CHEMICAL PROCESSES ON COMPOST

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Dear Professor,

FINAL RESEARCH REPORT "PRELIMINARY STUDIES ON MICROBIAL AND PHYSICO-CHEMICAL PROCESSES ON COMPOST".

With reference to the above, I am pleased to submit three copies of the Final Research Report entitled, "Preliminary Studies On Microbial And Physico-Chemical Processes On Compost".

Thank you.

Yours sincerely,

MARGARET CHAN KIT YOK
The Leader
Research Project

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ABSTRACT

The preliminary studies of the microbial dynamic and population of the composting process of ornamental palm leaf waste showed that the physico-chemical factors of the compost process played a vital role. The three phases of composting: the degradation phase, the conversion phase and maturation phase were indicated by temperature and pH pattern throughout the composting process of the palm leaves over a period pf 100 days. The temperature pattern showed a lower range of a classical decomposing process, rising from an initial 28°C to 32°C at the mesophilic stage and ranging 40°C to 43°C at the thermophilic stage before tapering to below 40°C. The pH experienced a slight drop from 6.8 to 6.7 before increasing to 7.1. The turning frequency and the shredding of the raw materials had accelerated the microbial activity. The carbon content decreased from 51.9% to 38.9% and nitrogen content increased from 0.63% to 4.18% attaining a final C/N ratio of 9:1. A rapid succession of mixed microbial populations with bacteria being dominant throughout the whole period. However, fungi, bacteria and actinomycetes formed the population at the later stage. Culturing microorganism using growth media resulted in 18 bacterial colonies, 19 actinomycetal colonies and 24 fungal colonies. The predominant microorganisms isolated from the growth media were the rod shaped bacilli, *Aspergillus* sp., *Rhizomucor* sp., *Paecilomyces* sp., *Humicola* sp. and *Thermoascus* sp. Direct isolation technique yielded species of dematiaceous hyphomycetes: *Curvularia lunata*, *Drepanospora pannosa, Helicosporium panacheum, Parapleurotheciopsis* sp., *Parasympodiella laxa* and *Torula terrestris*. The two most prevalent species of thermophilic fungi were the brown mycelium and the hyaline mycelium with coiled hyphal structures; neither of which have been reported or rarely reported in the composting process. Two macrofungi belonging to the Basidiomycetes were observed, the *Coprinus* sp and a species under the Coprinaceae family.

CHAPTER 1

1.0 INTRODUCTION

"It is ironic that composting, so lately embraced in many economies, is one of the oldest forms of recycling known to humankind. As societies become reacquainted with this practice, its value as a natural solution to problems, from overflowing landfills to anemic soils, will become apparent. Then, with the proper institutional and economic incentives, composting could become as commonplace as the recycling of cans, newspapers, or paper is today."

Gary Gardiner, *Recycling Organic Waste: From Urban Pollutant to Farm Resource (Anon. 2001)*

Rynk *et al.* (1992) defined composting as the biological degradation of solid phase organic material undergoing aerobic conditions into a relatively stable, humus-like product called compost. According to Hoornweg (1999), it is a natural process which provides several benefits: the process can be inexpensive; it addresses over 50% of a city waste stream; it reduces one of the world's largest contributors to Greenhouse gases; it enhances related recycling and incineration activities and it can produce a beneficial end product with unlimited market potential; or otherwise it simply recycles organic material back to the topsoil from where it is mixed through agricultural practices. The major goal of composting is therefore to reduce the amount of solid waste generated.