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# MICROBIAL ACTIVITIES DURING COMPOSTING OF SPENT PIG-MANURE SAWDUST LITTER AT DIFFERENT MOISTURE CONTENTS

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**Abstract**

*The changes in microbial properties, including total aerobic heterotrophs, $O_2$-consumption rate, ATP content, dehydrogenase activity and microbial biomass C and N of the spent pig-manure sawdust litter were examined during further composting. The effects of three moisture levels, 50% (pile A), 60% (pile B) and 70% (pile C), on the composting process were also evaluated. Piles A and B had very similar trends of change in temperature and microbial properties during the composting period but pile C was significantly different. Temperatures in the first two piles increased to a peak of 64–69°C by day 4, while that of pile C rose to a lower peak (58°C) on day 7. The high moisture content (about 70%) of pile C led to early cooling of the pile and decreased the production of microbial activity and biomass. Although water was added frequently to maintain the moisture content of each pile, it was difficult in practice to maintain the moisture content of pile C at 70%, since water leaked out from the pile. Therefore, a moisture content of between 50 and 60% can be considered as the optimal moisture level for further composting of the spent litter. In general, the total aerobic heterotrophs, $O_2$ consumption rate and ATP content of all piles increased dramatically during the thermophilic stage of composting, but then decreased slowly and were maintained at lower levels at the end of the composting process. Stability of microbial properties was observed at day 60, indicating that two months is enough to convert spent litter to a mature compost. Temperature was found to be correlated with ATP content, dehydrogenase activity and oxygen consumption rate, and so these parameters could be used to indicate microbial activity and degradation of the spent pig-manure sawdust litter. Copyright © 1996 Elsevier Science Ltd.*

*Key words:* Composting, spent pig-manure sawdust litter, microbial activity, microbial biomass, temperature, moisture.

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## INTRODUCTION

Much of the pollution in Hong Kong's coastal waters is land-generated and various studies on Hong Kong streams have stressed the magnitude of the problem (Hodgkiss & Griffiths, 1987). Agricultural wastes, particularly pig manure, have been shown to be the major contributors to stream pollution both in the New Territories and in parts of urban Hong Kong (Isaac & Revell, 1977). Several methods of waste disposal to control pollution problems caused by agricultural waste were evaluated and one of them is the pig-on-litter (POL) system. The POL system, known as *in situ* composting, has been developed as one of the recommended methods to treat pig wastes in Hong Kong (EPD, 1988). The system utilises a mixture of sawdust and a bacterial product as the bedding material on which the pigs are raised and the pig excreta are decomposed within the bedding material (EPD, 1990). Under this system, neither waste-water nor raw pig manure requires disposal, the only waste is the spent pig manure plus sawdust litter (spent litter) which is a mixture of sawdust, partially decomposed pig waste and microbial biomass. The spent litter disposed of from the POL system consists of high concentrations of organic matter, N, P, K and trace elements (Tam & Vrijmoed, 1990), and can be re-utilised as a soil conditioner and/or fertiliser. The spent litter also possesses a significant portion of active microbial biomass, which suggests that the decomposition of the spent litter is incomplete and that the spent litter could be similar to an immature compost (Tiquia *et al.*, 1995). Further composting of the spent litter to maturity could enhance its beneficial values.

Much of the research on composting has been focused on the changes in physico-chemical parameters, primarily in an effort to find a simple and reliable indicator of compost maturity, and to improve the efficiency of the process. However, very little information is available on the microbiota