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# An evaluation of aerobic and anaerobic composting of banana peels treated with different inoculums for soil nutrient replenishment

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ABSTRACT

This study sought to evaluate the efficacy of aerobic and anaerobic composting of inoculated banana peels, and assess the agronomic value of banana peel-based compost. Changes in the chemical composition under aerobic and anaerobic conditions were examined for four formulations of banana peel-based wastes over a period of 12 weeks. The formulations i.e. plain banana peel (B), and a mixture with either cow dung (BC), poultry litter (BP) or earthworm (BE) were separately composted under aerobic and anaerobic conditions under laboratory conditions. Inoculation with either cow dung or poultry litter significantly facilitated mineralization in the order: BP > BC > B. The rate of decomposition was significantly faster under aerobic than in anaerobic composting conditions. The final composts contained high K (>100 g $kg^{-1}$) and TN (>2%), indicating high potential as a source of K and N fertilizer.



## 1. Introduction

Uganda, sometimes referred to as "Banana Republic", is among the World's 20 leading producers of banana, with an annual production of 615,000 metric tonnes (FAO, 2007). Ninety percent of what is produced is consumed locally, generating large volumes of wastes that result from harvesting and processing such as: market-rejected bananas, banana peels, stems, and leaves. Sentongo and Munyagwa (2004) estimated 390,550 metric tonnes of waste peelings to have come off from an annual banana production of 610,000 metric tonnes. These wastes are currently dumped in landfills, rivers, lakes and other unregulated dumping grounds where upon decomposition, pose serious environmental hazards. Though sanitary landfill is the most common disposal method used, it is proving highly unsustainable due to land scarcity and pollution risks, especially in urban and peri-urban centers. Attempts to utilize these materials as fodder for peri-urban zero-grazing cattle have been inadequate in addressing the menace being caused. Therefore, there is need to develop appropriate disposal practices to mitigate negative impact on the environment.

Composting is among the waste management strategies that are gaining interest as a suitable option for organic waste disposal with economic and environmental profits, since the process leads to a stabilized final product, which can be used to improve and maintain soil quality and fertility (Larney and Hao, 2007). Composting of banana wastes to produce a stable fertilizer resource needs to be investigated as an alternative waste management pathway to landfilling, for potential benefit to the resource poor farmers of East Africa. Application of crop residue compost to soil is considered as a good management practice because it stimulates soil microbial growth and activity with the subsequent mineralization of plant nutrients (Eriksen, 2005). The effect of particular plant residue composts on soil properties, however, depends on its dominant nutrient component (Chaves et al., 2004).

Currently, smallholder farmers in Uganda use simple local composting techniques such as pit or aboveground piling methods to compost animal and household wastes. Pit composting creates anaerobic conditions within the pit that may result into slow stabilization rate and increases the potential risk to human health and the environment through groundwater contamination by leachate (Hudgins and March, 1998). On the contrary, aboveground piling method, usually done under shade, presents aerobic composting conditions since air currents constantly blow through the pile. The efficacy of pit (anaerobic) and heap (aerobic) composting of banana residue-based wastes is however, still largely unknown.

Several materials have been used as starters to enhance decomposition in the past; the actions of earthworms in enhancing composting have been extensively studied and include: substrate aeration, mixing, grinding, fragmentation, enzymatic digestion and microbial decomposition of substrate in intestine of earthworms

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