

## Effect of bulking materials and mixing ratios on concentration of nutrients during composting of raw faecal sludge from peri-urban areas

Eugene Appiah-Effah<sup>a,\*</sup>, Kwabena Biritwum Nyarko<sup>a</sup>, Eric Oforu Antwi<sup>b</sup> and Esi Awuah<sup>c</sup>

<sup>a</sup> Department of Civil Engineering, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

<sup>b</sup> Department of Environmental Engineering, University of Energy and Natural Resource, Sunyani, Ghana

<sup>c</sup> Office of the Vice-Chancellor, University of Energy and Natural Resource, Sunyani, Ghana

\* Corresponding author. E-mail: appiaheffah@yahoo.com

---

### Abstract

Composting of raw faecal sludge (FS) poses many difficulties due to its high moisture content (MC), high wet bulk density and low carbon to nitrogen ratio. The aim of this study were to (1) examine the suitability of bulking materials (BMs) and (2) investigate the effect of bulking material and mixing ratio on concentration of nutrients during composting of raw FS compost. Raw FS and BMs (wood chips and maize cobs) were sampled from three peri-urban communities. The raw FS showed an initial high MC (73%) which was greater than that required to start a compost process (55–65%). The results showed that the total carbon and nitrogen contents of all the experiments decreased at the end of the composting process. Composted materials at the end of the experiment showed lower concentrations of available phosphorus and potassium in all the experiments than the initial substrate materials. Experimental trial, Maize cob (1:2) is the most preferred due to the fact that it contained more nitrogen, phosphorus, potassium and also carbon which are essential nutrients for plant growth and for improving on the soil organic matter content.

**Key words:** bulking material, decomposition, raw faecal sludge, mature compost

---

### INTRODUCTION

The objectives of this study were to (1) examine the suitability of two common bulking materials (BMs) used in composting faecal sludge (FS) and (2) investigate the effect of BM and mixing ratio on raw FS compost mixture on selected compost parameters.

Scientists and researchers over the world are exploring many options to address the FS management problems that confront our environment. Large quantities of FS are generated daily and these are not properly disposed of due to lack of adequate treatment and disposal facilities. This however, need to be suitably treated and (or) properly disposed of in order to reduce their environmental impact. Composting is a widely used cost-effective and environmentally acceptable method for treating solid or semisolid biodegradable waste (Malińska & Zabochnicka-Świątek 2013). Composting is the biological decomposition of biodegradable waste which involves a complex transformation of the raw organic substrates, which are degraded and transformed into stable organic matter. During the biodegradation of the compost feedstock, nutrients such as nitrogen, phosphorus and potassium are released and recycled in various chemical forms through the microorganisms and invertebrates that make up the compost food web and become available for uptake by plants or microorganisms. These by-products are considered a critical factor for agricultural production (Senesi 1989; Haider