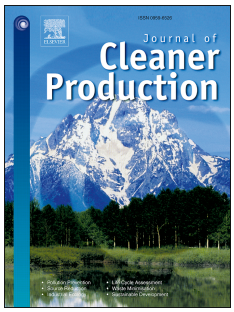
# Accepted Manuscript




Vermicomposting of phytomass: Limitations of the past approaches and the emerging directions

S.A. Abbasi, M. Nayeem-Shah, Tasneem Abbasi

PII: S0959-6526(15)00028-1

DOI: 10.1016/j.jclepro.2015.01.024

Reference: JCLP 5101

To appear in: *Journal of Cleaner Production*

Received Date: 22 April 2014

Revised Date: 24 December 2014

Accepted Date: 8 January 2015

Please cite this article as: Abbasi SA, Nayeem-Shah M, Abbasi T, Vermicomposting of phytomass: Limitations of the past approaches and the emerging directions, *Journal of Cleaner Production* (2015), doi: 10.1016/j.jclepro.2015.01.024.

# Vermicomposting of phytomass: Limitations of the past approaches and the emerging directions

*by*

**S. A. Abbasi[*], M. Nayeem-Shah,** and **Tasneem Abbasi**

Centre for Pollution Control & Environmental Engineering
Pondicherry University, Chinakalapet
Puducherry 605 014, India

## Abstract

In nature earthworms process enormous quantities of leaf litter and other forms of plant debris by ingesting them and converting them into vermicast. The latter is widely recognized as a soil-friendly and plant-friendly organic fertilizer. Earthworms also consume animal droppings but the quantities of plant biomass processed by earthworms are several times greater than the quantities of zoomass they handle. Yet, when controlled vermicomposting is done to process biodegradable solid waste, it is almost entirely focused on animal manure or food waste. Leaf litter, paper waste, terrestrial/ aquatic weeds, or crop waste is rarely vermicomposted on a large scale.

This paper assesses the attempts made so far to vermicompost plant-based substrates and tries to identify the reasons why the laboratory-scale studies have not evolved into larger-scale initiatives in vermicomposting such substrates. Emerging evidence of the efficacy of the high-rate vermicomposting technology in the direct processing of phytomass into fertilizers has been presented.

***Keywords:*** Earthworms, phytomass, vermicomposting, vermicast, high-rate vermicomposting

## 1. Introduction

Alongside ants and termites, earthworms are the animals who process the largest quantities of soil in nature (Feller *et al*., 2003; Premalatha *et al*., 2013). They ingest debris of dead plants along with animal droppings and soil, thereby contributing to the movement and turnover of the soil, simultaneously helping in mineralization of the dead phytomass by converting large portions of it into vermicast (Edwards *et al*., 2011). Of the three types of earthworms, characterized on the basis of their food preference—phytophagous, geophytophagous, and geophagous—the first named category specializes in feeding on phtyomass. The second named category also contributes substantially to the mineralization of phytomass (Gajalakshmi and Abbasi, 2004; 2008).Together, the three types of earthworms process billions of tons of phytomass per year (Abbasi and Ramasamy, 2001; Edwards *et al.*, 2011).

*Corresponding author: abbasi.cpee@gmail.com

#Concurrently: Visiting Associate Professor, Department of Fire Protection Engineering, Worcester Polytechnic Institute, Worcester, MA 01609, USA.