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Short Communication

Salmonella Elimination during Composting of Spent Pig Litter

Abstract

A windrow composting trial was carried out to investigate the effects of composting on the elimination of Salmonella *from spent pig litter (a mixture of partially decomposed pig manure and sawdust). Results showed that temperature was the main factor affecting the elimination of* Salmonella. *At temperatures between 64 and 67°C for 2–3 weeks, the pathogen was effectively killed. The elimination of* Salmonella *corresponded with the progressive decrease of faecal coliforms and faecal streptococci. By the end of the composting process (day 91), the faecal coliform and streptococcal numbers were reduced to 2.27 and 2.12* Log_{10} *MPN* g^{-1}*, respectively. When these low levels are reached, the elimination of* Salmonella *in the spent litter is successfully achieved. The populations of faecal coliforms in all six potting media were more than twice as high as those found in the composted spent litter, indicating that although faecal coliforms were not eliminated during composting, their levels were lower than in commercial potting media. © 1998 Elsevier Science Ltd. All rights reserved.*

Key words: Salmonella, faecal coliforms, faecal streptococci, composting, pig-manure.

INTRODUCTION

Spent pig litter (a mixture of partially decomposed pig manure and sawdust) contains high concentrations of organic matter, nutrients and trace elements and can be re-utilised as a soil conditioner and/or fertiliser (Tam and Wong, 1995), but it requires further composting in windrows to reach maturity (Tiquia *et al.*, 1996a). Previous studies on composting of spent litter have concentrated on the evaluation of environmental conditions for efficient composting and the development of criteria for judging compost maturity (Tiquia, 1996; Tiquia *et al.*, 1996a,b; Tiquia *et al.*, 1997). Most of the criteria used in these studies were based on those physical and chemical parameters of the spent litter whose behaviour reflected the metabolic activity of microorganisms involved in the process. In cases where the mature spent-litter is to be applied to agricultural soils, and where public health aspects are of concern, the levels of pathogens and their elimination during the composting process are important criteria which must also be evaluated.

One of the major objectives of composting is to produce a hygienically safe and agriculturally useful product. However, monitoring pathogens is a difficult and lengthy procedure unsuited to routine application. In view of the wide array of pathogens that can be present in raw waste, a thorough analysis of the entire compost output for its pathogen content would become an enormous problem. Therefore, it is more practical to select a few representative pathogens that are likely to be present in most raw wastes. In the present study, *Salmonella* was used as a representative pathogen as it is generally present in animal wastes (Steele, 1973). Moreover, the presence of *Salmonella* in the final compost product would indicate poor sanitisation (Bertoldi *et al.*, 1991). The use of indicator organisms whose removal characteristics are similar to these pathogens has also become popular because it is a shorter and more convenient technique (Pereira-Neto *et al.*, 1986). The present study was carried out to investigate whether *Salmonella* was eliminated during windrow composting and to examine the use of various organisms as indicators of this elimination. The levels of *Salmonella* and indicator organisms in the composted spent litter were compared with those in commercially available potting media to examine the safety of the spent litter as a potting medium.

METHODS

Duplicate piles of the spent litter were set-up in an open shed and their moisture contents were adjusted to 60% immediately after piling. Each pile was triangular in shape, about 2 m in width at the base and 1.5 m in height (Tiquia *et al.*, 1996a). The piles were turned every 4 days using a truck and front-end loader. During the composting process, ambient temperature and temperature at a depth of 60 cm in each pile were monitored before turning. Samples were taken at 5 symmetrical locations in each pile and were combined to give a composite sample.