Composting and the Fate of Ascaris lumbricoides Ova*

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Abstract

Viable Ascaris lumbricoides ova counts were used to assess the efficiency of laboratory, pilot plant, and full-scale composting experiments utilizing dried digested sewage sludge and raw domestic refuse. The results have indicated that the turning and watering of windrows should be undertaken weekly throughout the whole maturation process and that the period of maturation, providing that temperatures of 65°C are generated, should be maintained for at least seventy days to ensure Ascaris ova inactivation.

Introduction

Conventional methods employed for the disposal of sewage sludges are land disposal, sanitary landfill, incineration, ocean dumping and composting. Land application as practised in many countries, could create an hygienic risk, since microbial pathogens and parasite ova if present in the sludge are a distinct hazard to public health. The high cost of land prohibits many sanitary landfill or land disposal schemes and legislative proposals calling for stricter environmental pollution control measures reflect the increasing awareness of this problem in many countries.

Utilization of digested sewage sludge in the controlled composting of domestic refuse offers a less hazardous method of sludge disposal because heat development during the thermophilic stage (47 to 65°C, 70 days) of composting should inactivate any vegetative pathogens and parasite ova present. Furthermore, the addition of digested sludge improves the biological efficiency of the composting and the chemical quality of the product.

Golucke and Gotaas (1954) reported that the magnitude and duration of high temperatures, as well as the antibiosis characteristics of a mixed population of micro-organisms, offered sufficient basis for believing that no pathogens, parasites or parasite ova could survive the composting process. Unfortunately, Golucke and Gotaas based their assumption on the thermal death points of some common pathogens and parasites in aqueous solutions in the laboratory, which bore little resemblance to conditions in the compost heap.

The lack of knowledge of the helminthological and indeed the bacteriological quality of composites containing sewage sludges supplied to the general public led Krige (1964) to initiate an investigation into the problem. Matured compost samples from non-mechanized sources at various municipalities and the product obtained from a rotating drum pilot composting plant were investigated. The results showed that the product from non-mechanized methods contained Ascaris lumbricoides ova as well as coliform bacteria. Compost produced by the pilot plant was consistently free of Ascaris ova, but contained high numbers of coliform bacteria. Krige did not regard coliform counts as a suitable index of the hygienic quality and recommended regular examination for viable Ascaris ova. It was later found that the method used by Krige to determine Ascaris ova in compost did not always succeed in recovering the ova even though these were known to be present. The recommendation that the incidence of Ascaris ova should be used as an indicator test for the helminthological quality of sludge-enriched compost was very valuable (Keller, 1951) and was thereafter adopted by the National Institute for Water Research (NIWR).

The application of a modified method to recover Ascaris ova (Steer et al., 1974) has shown that viable ova were at times not only present in freshly stabilized compost from mechanical plants but also in some samples of eight weeks old matured compost.

Research reported by Keller (1951) and in the Chinese Medical Journal (1975) on the thermal deathpoint of Ascaris ova also revealed many contradictions, as all results were obtained with Ascaris ova suspended in aqueous solutions in the laboratory. It is apparent that survival rates determined for Ascaris ova in aqueous solutions are not directly applicable to

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