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Evaluating the effect of environmental factors on pathogen regrowth in compost extract.

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Abstract

Pathogenic microorganisms may survive the composting process in low numbers and subsequently regrow to high levels under favorable conditions. The objective of this study was to investigate the regrowth potential of Salmonella spp., Escherichia coli O157:H7, and Listeria monocytogenes in dairy-based composts under different environmental conditions. Water extract of commercially available dairy compost was used as a model system. Cocktails of five rifampin-resistant strains of each pathogen previously grown in reduced nutrient media (1/2 or 1/10 strength of tryptic soy broth, TSB) were inoculated into water extract of compost of different ratios (1:2,1:5, and 1:10, w/v), and then stored at 35 degrees C or 22 degrees C for 7 days. The strains exhibiting greatest survival or regrowth were identified by pulsed-field gel electrophoresis (PFGE). At 22 degrees C, both E. coli O157:H7 and L. monocytogenes multiplied in all compost extracts, whereas Salmonella spp. regrew in both 1:2 and 1:5 compost extracts but not in 1:10. For all three pathogens, incubation at 22 degrees C provides better conditions for regrowth than at 35 degrees C. Both Salmonella and E. coli O157:H7 previously adapted to nutrient-limited broth (1/10 strength of TSB) regrew in compost extracts to higher populations than the control cultures grown previously in full strength of TSB. In the absence of indigenous microorganisms, all three pathogens regrew even in the most diluted sterile compost extract (1:10) with growth potentials ranging from 2.30 to 3.59 log CFU/ml. In nonsterile compost extract with ca. 5 log CFU/ml of background microorganisms, all three pathogens regrew only in the most concentrated compost extract (1:2) with much less population increases ranging from 0.70 to 1.43 log CFU/ml. Compost extract samples of all ages supported the regrowth of both Salmonella and E. coli O157:H7 with population increases ranging from 0.95 to 2.32 log CFU/ml. The PFGE patterns for E. coli O157:H7 isolates from sterile compost extracts matched with either the spinach outbreak strain or an avirulent B6914 strain. These results demonstrated that compost extract of dairy-based compost contained sufficient nutrients for pathogen regrowth. Cultures previously adapted to low nutrient media regrew to higher populations than control cultures; however, indigenous microflora suppressed the pathogen regrowth in compost extract, especially at 35 degrees C.

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