

COMPOSTING

INACTIVATION OF ZOOBOTIC PATHOGENS DURING STATIC COMPOSTING OF CHICKEN LITTER AND PEANUT HULLS

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During aerobic composting, the primary factor responsible for inactivation of fecal pathogens is heat generated from the metabolic activity of thermophilic microorganisms. Moreover, to ensure inactivation of pathogens at the surface of static compost piles, it is recommended that compost be turned periodically during the first weeks of composting. This safeguard practice, however, is not often implemented in situations where labor and resources are limited. To develop alternative management strategies for these situations, baseline data is needed to determine inactivation profiles of zoonotic pathogens at surface and interior sites of static piles. The fate of zoonotic pathogens [gfp-labeled *Escherichia coli* O157:H7 (Shiga toxin-negative) and *Listeria innocua* and rifampicin-resistant *Salmonella* Typhimurium (vaccine strain)] in the field was monitored at both interior and surface sites of static composting piles composed of chicken litter and peanut hulls. Zoonotic pathogen populations declined by 4-8 log CFU/g within 4 days of composting but were still detectable by enrichment culture. Despite exposures to elevated temperatures, *Salmonella* continued to be detected in interior samples by enrichment for up to 14 days after composting was initiated. In surface samples, the fate of pathogens was dependent on the season and ambient temperature conditions in which composting was conducted. During the summer, *S. Typhimurium*, *E. coli* O157:H7 and *L. innocua* were detected by enrichment only in 3-day, 3-day, and 7-day compost surface samples, respectively. In contrast, 28, 56, and 56 days of composting in the late fall/early winter were required to reduce *S. Typhimurium*, *E. coli* O157:H7, and *L. innocua* populations, respectively, to levels detectable only by enrichment. In conclusion, zoonotic pathogens survived on the surface of unturned static composting piles containing chicken litter for up to 2 months.

INACTIVATION OF *ESCHERICHIA COLI* O157:H7 AND *LISTERIA MONOCYTOGENES* IN COW MANURE COMPOSTING SYSTEMS

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Aerobic composting may be applied to manure whereby microbial metabolite degradation of organic matter generates heat for inactivation of pathogens. When equipment and manpower are not available to turn the compost mass and expose all the material to sufficient levels of heat, other management guidelines are needed to assure that pathogen inactivation of surface compost has been achieved. Towards that end, research has been addressing the potential for the initial carbon:nitrogen (C:N) ratio of the compost mixture to affect pathogen inactivation. Using a cow manure, straw, and cottonseed mixture in a laboratory-scale bioreactor, C:N ratio did not significantly affect the time to inactivation of *Listeria monocytogenes*. In contrast, *Escherichia coli* O157:H7 survived for significantly longer periods of time in 40:1 C:N systems than in 30:1 or 20:1 systems despite the fact that the cumulative heat exposure of the former system was much greater than the exposure encountered in the two latter systems. In addition, an escalation in pH to values between 8 and 9 occurred initially for 40:1 C:N systems whereas 20:1 and 30:1 systems experienced an initial decline in pH to values between 5.5 and 6 before climbing to alkaline values (8-9) after 2 days of composting. It is hypothesized that organic acids generated in the acidic stage of 20:1 and 30:1 systems may act in concert with heat to inactivate *E. coli* O157:H7. Such situations may be beneficial to the inactivation of pathogens on the surface of compost piles where temperatures are found to increase only slightly above ambient.