

COMPOSTING

DETECTION OF *SALMONELLA* SPP. BY PCR IN POULTRY LITTER

(R. Sanchez-Ingunza, M.A. Harrison, R.A. Morrow, and C. Reilly)

Salmonella spp. are important foodborne pathogens in the United States and can be disseminated through the food chain via poultry products, by-products and poultry litter. Poultry litter can be used as a soil amendment. Prompt identification of this microorganism in poultry litter by a reliable and rapid method is important to establish an effective program for controlling *Salmonella*. This study determined the optimal pre-enrichment and enrichment incubation conditions and detection limits for PCR to detect *Salmonella* in poultry litter. The detection capability of PCR was compared to culture methods using 15 *Salmonella enterica* serotypes. As PCR targets, *sdia* and *hila* genes were used. The results were compared by calculating the kappa indexes at 95% CI. The shortest combination times for the pre-enrichment and enrichment steps which led to positive results by PCR were 6 h in 0.1% peptone water and 18 h in Rappaport-Vassiliadis broth, respectively. The calculated detection limit for the PCR tests was 10 *Salmonella* CFU/100 g of litter. The aforementioned time schedule and calculated detection limit were selected for further analysis with the 15 *Salmonella* strains. There was no significant difference in the PCR identification of *Salmonella* when either *sdia* or *hila* were used as targets ($p < 0.0001$). When PCR and the conventional methods were compared, they disagreed and this disagreement was statistically significant ($p < 0.05$). PCR was not able to detect *S. Agona* while *S. Montevideo* and *S. Typhimurium* were not re-isolated by the conventional microbiological method. The results of these experiments suggest that shorter incubation times might lead to false negative results in PCR tests. The analysis of multiple samples at longer incubation times for the enrichment step might increase PCR sensitivity and reduce the disagreement between tests.

INACTIVATION OF PATHOGENS IN CHICKEN LITTER COMPOST MIXTURES

(M. C. Erickson, J. Liao, and X. Jiang)

Initial C:N ratios of cow manure compost formulations were found to have a significant effect on survival of *Salmonella* spp. but not *Listeria monocytogenes*. A study was done to determine how C:N ratios influence pathogen survival when chicken litter was used as the manure source. Laboratory-scale bioreactors were used for composting manure mixtures formulated to initial C:N ratios of 20:1, 30:1, and 40:1. The initial C:N ratios had a significant effect on survival of both *Salmonella* spp. and *L. monocytogenes*, with greatest survival in formulations of 40:1 compared to 20:1 or 30:1. Heat was not the contributing factor to differences in pathogen survival as pathogens received slightly less heat in the 20:1 or 30:1 formulations than in 40:1 formulations. More ammonia was produced in the 20:1 and 30:1 formulations than the 40:1 formulations and likely contributed to pathogen inactivation.

INACTIVATION OF PATHOGENS IN ANIMAL MANURE COMPOST SYSTEMS SIMULATING SURFACE CONDITIONS

(M. C. Erickson, C. Smith, and X. Jiang)

Compost mixtures were formulated with wheat straw, cottonseed meal, and different manures (hog, chicken, or cow) to have initial C:N ratios of 20:1, 30:1, or 40:1. The mixtures were placed in trays to simulate responses at surface sites of compost piles and then held at 20, 30, or 40°C. On a weekly basis, moisture levels in samples were adjusted to initial values (30% or 60%). At both 20 and 30°C, *Salmonella* spp. was inactivated more rapidly in compost formulated with hog manure, followed by those formulated with chicken manure and then cow manure. Inactivation of *Salmonella* was greater in chicken compost formulations of 20:1 compared to formulations of 40:1 when held at either 20 or 30°C. The pH of all compost mixtures increased more when moisture contents were initially formulated to 60% compared to 30%. Weekly additions of water to reconstitute the compost samples to initial moisture contents also resulted in higher pH values than samples not reconstituted. Adjustment of moisture to initial levels on a weekly basis had no significant effect on survival of *Salmonella* spp. in compost mixtures. Initial pH of cow manure did influence the subsequent survival of *Salmonella* and *E. coli* O157:H7 in compost mixtures held at 40°C. Reductions in populations of both pathogens after 4 weeks of storage

were only ~2-3-log CFU/g in compost formulations containing cow manure with an initial pH of ~8.5-9.0. In contrast, a 6-log CFU/g reduction occurred within one week for both pathogens when compost formulations contained cow manure with an initial pH of ~7. In these systems, volatile acid concentrations were much higher than in the pH 9 cow manure compost and suggests that these acids may act in concert with heat to inactivate pathogens more rapidly than heat alone.

