RESEARCH ABSTRACT

ENVIRONMENT

Title: Comparison of efficacy, emissions, compost characteristics, and costs of in-vessel rotating drum and open static pile composting of swine carcasses, whole and ground. **NPB #09-078**

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Scientific Abstract: Swine carcasses (292 ± 7.3 kg per batch), whole (W) or ground (G), were composted using rotating drum in-vessel (IV) or open static pile (OSP) composting systems. Dairy manure compost, horse stall bedding, finished swine mortality compost, and dry wood shavings were mixed together (analyzed percent H_2O, percent N, and C:N were 48.7 ± 0.32%, 0.76 ± 0.075%, and 31.8 ± 2.51, respectively) and added as the only amendment to each batch of mortality compost. Total mass per batch was 812 ± 7.3 kg. The eight batches were placed in eight individual rooms (2 replications per treatment). Oxygen consumption and air emissions of CO_2, CH_4, NMTHC, NH_3, NO, NO_2, N_2O, H_2S, and SO_2, were measured continuously for 20 d during the primary phase (d 1 to 20), and a 15 d period 1.5 mo later (secondary phase), where all batches were further composted as open static piles (identity preserved). Oxygen consumption did not differ among treatments, being unaffected by compost system, carcass form and phase of composting. Carbon dioxide emission was greater ($P < 0.05$) in the primary phase than in the secondary phase. Mass of CO_2 per day tended to be greater with use of the IV system of composting ($P = 0.07$). The IV system emitted more ($P < 0.05$) NMTHC, NH_3, and SO_2, and less ($P < 0.05$) CH_4, NO, N_2O than the OSP system. Composting system did not affect the daily mass of NO_2 and H_2S emitted. In the primary phase, the IV system generated about 95% less ($P < 0.05$) CH_4 than did the OSP system (0.31 vs. 6.7 g/d, respectively). Other environmentally-interesting differences ($P < 0.05$) between the IV and OSP systems in the primary phase were NMTHC (4.13 vs. 0.19 g/d), NH_3 (86.96 vs. 5.04 g/d), and N_2O (-1.00 vs. 1.94 g/d) emissions for IV and OSP systems, respectively. The amount of CH_4, NMTHC, NO, and SO_2 gases emitted in the second phase did not differ among treatments. Nitrous oxide emissions were greater ($P < 0.05$) with the use of the OSP system than with the IV composting system in the secondary phase. Emissions were greater ($P < 0.05$) for CH_4, NMTHC, NH_3, NO, and SO_2 gases in the primary phase as compared to the secondary phase, but not for

N_2O, which was greater ($P < 0.05$) in the secondary phase than it was in the primary phase. Carcass form did not affect amounts of emissions. For a 2000 head finishing swine farm with a 2% mortality rate, we estimate that CO_2e emitted annually from the composting of mortality for 6 months 1908 and 1596 kg depending on which method of composting was used (IV or OSP, respectively). In conclusion, whether carcasses were ground or left whole changed did not result in differences in gas emissions. In-vessel and OSP composting systems emitted different amounts of gases in the early, active phases of composting; including those gases considered greenhouse gases.