RESEARCH ABSTRACT

ENVIRONMENT

Title: Above Ground Burial/Composting of Swine Mortalities – **#19-218 IPPA**

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Scientific Abstract:
This study was a multi-faceted approach to determine whether Above Ground Burial (AGB) is a viable method for mass mortality disposal in the Western Cornbelt. We utilized a 2x2 factorial design with carbon source (wood chips vs corn stalks) and season (June vs November) as the main effects. The trial began in June of 2019. We dug 5 pits, with each pit being 8 feet wide, 60 feet long, and 22 inches deep. Test wells were put in each pit at 6", 18" and 36" below the bottom of the pit. Two pits were used for the June burial, two pits were used for the November burial, and one pit was used in August to compare intact vs opened carcasses. For both the June and November burials, one pit was layered with 22 inches of wood chips and the other pit was layered with 22 inches of corn stalks. Forty-four market weight mortalities were placed in each pit with temperature probes inserted into the carcasses. Feeder pigs were challenged with Seneca Valley Virus (SVV), euthanized, and placed in the June and November pits. After all pigs were placed in the pits, they were covered with 24" of fill dirt. Each month 2 feeder pig carcasses were dug up and tissue samples, carbon sources, and pit water samples were taken for SVV analysis. Monthly water samples were analyzed for SVV, nitrate-N, and E. coli concentrations. An add-on to the project was a bioassay where SVV-free weaned pigs were challenged with either tissue, water, or carbon samples that tested PCR-positive for SVV in order to determine whether or not it was an active virus.

Temperatures of the carcasses were higher (4^0F) than the soil and air temperatures but were not as high as reported in other trials. We believe a major factor contributing to this was that 2019 was one of the wettest summers in Brookings, and the mortalities were too wet for optimum composting breakdown. As expected, carcass temperatures from the June burial were higher than that of the November burial, and there was more breakdown of the June carcasses than the November carcasses since microbial activity decreased as temperatures dropped. It took until the summer of 2020 before the November burials reached maximum temperatures. For both seasons, carcasses placed on wood chips had higher temperatures (1.6^0F) than those placed on corn stalks.

Carcass decomposition was assessed monthly by visually appraising the carcasses when the SVV-challenged pigs were dug up. While there was not a numeric scale, mortalities placed on corn stalks were typically more decomposed than those of carcasses on wood chips.

Water samples from the wells in the pits indicated relatively high nitrate-N concentrations soon after placement, but those levels decreased over time. Nitrate-N concentrations were greater in the corn stalk pits (10 ppm) versus the wood chip pits (5 ppm), but this is another indicator that there

was more carcass breakdown in the corn stalks pits. E. coli concentrations were highly variable (0 to 18,000 CFU/100 ml) and were not different between treatments or well depth. As expected, E coli numbers were lower in cold months as decomposition and microbial activity decreased. While we had expected the numbers to be lower, the excess rain reduced composting activity and subsequently temperature, so it wasn't hot enough to have more E. coli breakdown.

Seneca Valley Virus was detected in the water samples, but only from the 6" and 18" wells. No SVV was detected from water from the 36" wells. Also, only one water sample from the corn stalk pit (18") tested positive for SVV while 10 samples over 11 months from the wood chop pit tested positive for SVV. It should be noted that SVV was detected in the July 2019 through November 1, 2019 testing, but none through the May 2020 sampling. Seneca Valley Virus was detected in the carcasses of the challenged feeder pigs, and in the carbon source and water surrounding them. However, the SVV concentrations were lower in the carcasses in the corn stalks as compared to the wood chips. Since we used PCR testing to determine the presence of SVV, we did a bioassay challenging SVV-free weaned pigs with the PCR-positive material to determine if the PCR-positive SVV material was infective. Fouteen days after challenge, none of the animals seroconverted.

These results indicate that AGB is an effective way to dispose of mass mortalities in the Western Cornbelt, and corn stalks are effective carbon source. There is a risk of leaching of E. Coli and nitrate-N (but not of SVV) so care should be taken to prevent placing AGB sites over sensitive aquifers or areas with sandy or loamy soils with a high hydraulic conductivity, or a high water table.