EFFECTIVENESS OF THREE MANURE PIT ADDITIVES

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Background

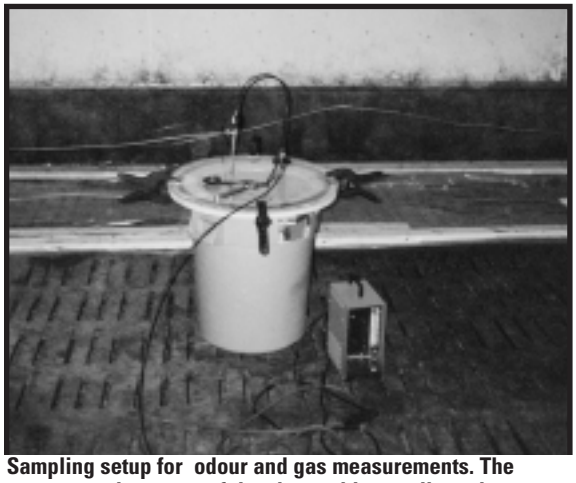
Pit additives are put on the market to offer solutions for the problem of odour nuisance from pig barns. They are also intended to improve manure characteristics such as handling ease, pit gas production, nutrient retention and waste strength.

Most of the scientific testing in this area has been done in laboratory or on a bench scale. To evaluate the effectiveness of such products in conditions duplicating most commercial barn situations, a protocol had to be developed.

The objective of this experiment was to evaluate the effectiveness of three manure pit additives in reducing odour threshold and gas concentrations above the manure surface, in reducing solids and manure strength, and maintaining nutrient and micronutrient content in the manure, for commercial-scale manure pits and simulated lagoons.

The products and the procedure

The additives were American BioCatalysts, Pit Boss and Westbridge (H4-5O2) with respective product costs of $0.07, $0.19 and $0.02 per pig marketed. Two trials were conducted in a commercial room at PSCI. Trial 1 consisted of an indoor phase realized directly in the manure pits under growing-finishing pig pens with manure being treated over a five-week period. An outdoor phase followed where manure was transferred and stored for a four-week period in plastic tubs to simulate storage in lagoon. The second trial (Trial 2) had only the indoor phase of five weeks treatment to provide additional replicates of Trial 1 and allow for statistical analysis of the results. In total, eight replicates of the indoor treatments were obtained.



Sampling setup for odour and gas measurements. The apparatus sits on top of the slats, with sampling tubes going down to just above manure level.

The geometry of the outside tubs (plastic cattle waterers) was selected to simulate a lagoon situation with a high surface exposure compared to manure height. An evaluation of inside phase manure characteristics and odour emissions was completed inside on days 28 (week 4) and 35 (week 5). For the outside phase, measurements were taken after a 4-week storage period (day 63).

The performances

Overall, the performances of the additives were quite mixed compared to manure that had not received any additive treatment.

Odour threshold reductions ranged from zero reduction to 11 per cent reduction during the indoor phase (as showed on Fig. 1) and zero reduction to 66 per cent reduction during the outdoor phase. Hydrogen sulphide concentrations were reduced from 57 to 76 per cent and ammonia concentrations were reduced by 5 to 33 per cent during the experiment (Fig. 2).

All of the additives seemed unable to achieve much solids reduction (Fig. 3) or solubilization during the indoor phase of the experiment, but improving nutrient retention and availability was a strength of all of the additives. Nitrogen content and availability was improved by 7 to 19 per cent and 9 to 25 per cent, respectively during the indoor trial. Similarly, phosphorous availability was increased from 16 to 24 per cent by the additives during the indoor phase.

The additives did not perform very well in reducing chemical oxygen demand, providing no reduction or a minor reduction during the indoor phase. In general, the additives provided some benefits but were unable to improve

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all aspects of the manure.

Future research

The large variability within the results means that it will be difficult to firmly predict how additives will perform. To make progress in pit additive technology, more basic investigations are required to observe and understand the mode of action of additives on emissions from characteristics of pig manure. Such understanding will likely allow for more control in the variability of manure pit additive effectiveness.

Acknowledgements

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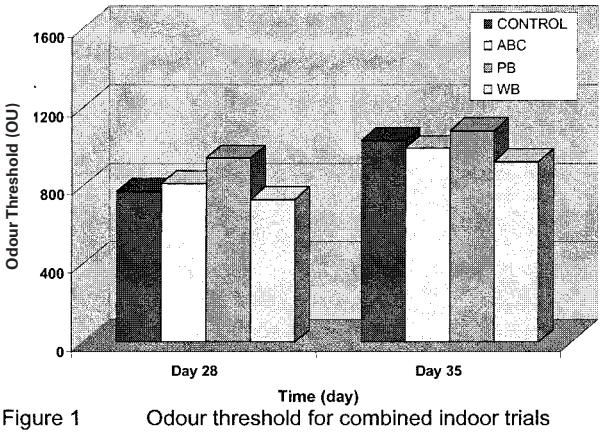

Figure 1 Odour threshold for combined indoor trials

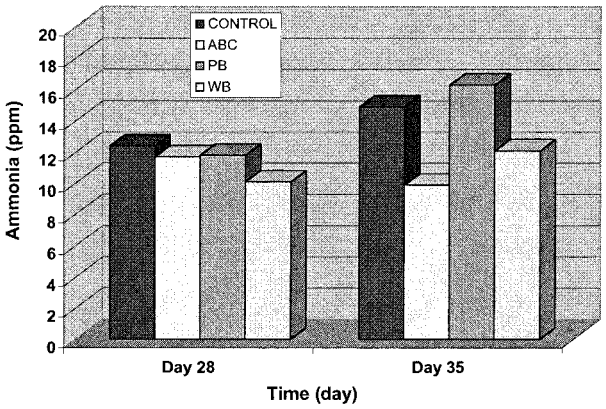

Figure 2 Ammonia concentration for combined indoor trials

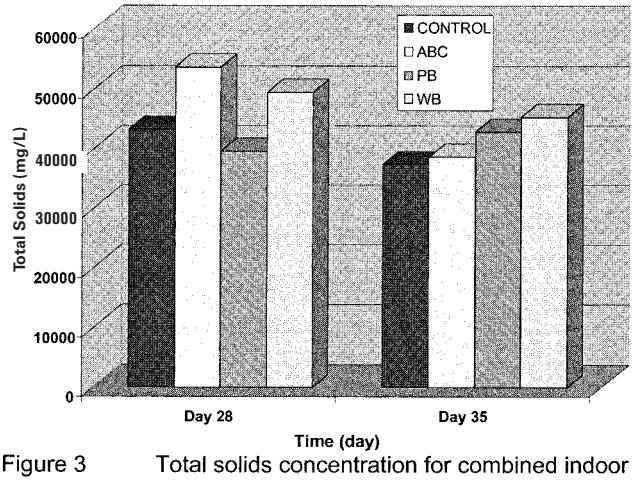

Figure 3 Total solids concentration for combined indoor trials