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GENERATION OF CARBON DIOXIDE AND METHANE FROM STORED CATTLE AND PIG SLURRY

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ABSTRACT

A large storage space on livestock farms is required for slurries to conform with long storage times specified in Codes of Good Agricultural Practice (England and Wales, Scotland). These are 4 months in England and Wales and 6 months in Scotland. It allows applications of slurry to land in times appropriate to a proper slurry nutrient utilisation and prevention of environmental pollution.

Slurries undergo 'cold' anaerobic digestion during storage. Digestion affects the slurry characteristics as well as it encourages development of gases. An experiment was conducted, to assess the generation of carbon dioxide and methane during storage of cattle and pig slurry.

Both slurries were stored in separate 250mL polyethylene gas tight containers at controlled laboratory conditions at three different temperatures of 5, 10 and 15°C for 27 weeks. Total solids (TS) were 74.5 and 84.1g.L⁻¹, and chemical oxygen demand (COD) was 92 and 117 g.L⁻¹ for cattle and pig slurry respectively. Volumes of gases were measured after purging the containers with helium. The gasses were analysed by a gas chromatograph.

Although TS and COD of both cattle and pig slurry were similar, the development of CO₂ and CH₄, during 27 weeks of storage, were quite different. Only 48mg and 190mg of CO₂ were generated by a litre of cattle slurry while 2,660mg and 6,700mg were generated by pig slurry at 5 and 15°C respectively. Similarly, smaller quantities of CH₄, 8mg.L⁻¹ and 100mg.L⁻¹, were developed by cattle slurry and 370mg.L⁻¹ and 593mg.L⁻¹ from the pig slurry at 5 and 15°C storage temperatures. The highest rates of methane development were observed during the first 8 weeks of storage of cattle slurry. The high methane production rates from pig slurry lasted for 15 weeks, nearly twice as long as for cattle slurry.

These results demonstrate, that the higher storage temperature and a longer storage time, the more CO₂ and CH₄ development from slurries can be expected. With further development of odorous compounds in slurries, the prolonged slurry storage may have a detrimental effect on the environment.