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EFFECTS OF CHLORTETRACYCLINE AND Cu ON SWINE MANURE ANAEROBIC DIGESTION

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Abstract

Chlortetracycline (CTC) and copper (Cu) are simultaneously used as feed additives to improve the growth performance and to prevent infection in pig farming. After ingestion by animals, most of these compounds are excreted and coexist in swine manure. They might have an influence on anaerobic digestion when the swine manure is used as substrate in a biogas plant. The purpose of this study was to investigate the effects of both CTC and Cu on batch swine manure anaerobic digestion in order to better estimate and control the risk from antibiotics and heavy metals to anaerobic digestion. The results showed that high concentrations of CTC (32.86 mg/L) had no significant influence ($P > 0.05$) on the cumulative methane production, but seriously delayed the daily methane production peaks. The effect of both CTC and Cu spiked together on methane production was much greater than either of them spiked separately. There was significant difference ($P < 0.05$) in daily methane production when CTC and Cu spiked concentrations were up to 4.14 and 98.42 mg/L during the swine manure anaerobic digestion. Furthermore, methane production was inhibited completely when CTC and Cu spiked concentrations were up to 11.55 and 144.83 mg/L. The removal rate of CTC was up to 85% after anaerobic digestion. The transformation of Cu from Cu-exchangeable, Cu-carbonate, Cu-bound to Fe/Mn forms to more stable forms of Cu-organic and Cu-residual occurred during the swine manure anaerobic digestion, resulting in 80% of the total Cu being bound as stable Cu-organic after anaerobic digestion. These results indicated that anaerobic digestion had a positive influence on antibiotics removal and heavy metals transformation in swine manure.

Key words: anaerobic digestion, chlortetracycline, copper, swine manure

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