EFFECT OF DIFFERENT PRE-TREATMENTS ON METHANE YIELD FROM LIGNOCELLULOSIC SUBSTRATES AND PIG MANURE

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ABSTRACT

In recent years the energy production from renewable resources has widely increased. Anaerobic digestion of crop residues and energy crops with pig manure gives good results providing energy and contributes favourably to the environment. The use of these substrates for Biogas production through anaerobic digestion processes has fostered the promotion of many studies. These processes turn the complex organic matter existing in the substrate into biogas, which is rich in methane (usable in the same way that natural gas), leaving like by-product an inoffensive and nutritious residue usable like excellent fertilizer for agriculture.

The rate limiting step in the use of lignocellulosic substrates for the Biogas production is the hydrolysis of complex polymeric substances due to their cellulose and lignin content (Pavlosthathis and Giraldo-Gomez, 1991). The conversion of cellulose in methane is carried out in two steps, each one of them catalyzed by different enzymes from different microorganisms. The first step (hydrolysis and acidification) is the breakage of the cellulose (a big polymer) into soluble organic matter (simple and short chains) which is then fermented in the second step (methanegenesis). Therefore a perfect pre-treatment would increase the surface area and reduce the lignin content and the crystallinity of the cellulose (Fan et al., 1981).

With the objective of improving and increasing the potential of the methane production from lignocellulosic substrates with pig manure, different physical and chemical pre-treatments in whole crop maize silage and corn grains were carried out aiming to speed up the hydrolysis phase and to increase the availability of soluble compounds. These pre-treatments were: Grinding of both substrates (increase surface area), incubation in water of the grains, autoclaving (pressure and heat treatment) of the silage and alkaline incubation of the silage. Alkaline treatment is known to break the chains between hemicellulose and lignin and to increase the pore size (Tatta, 1981).

The potential of the methane production from the substrates was then evaluated through anaerobic batch fermentation tests using pig manure like inoculum. Another pre-treatment (not jet carried out) are: extrusion (pressure and temperature), steam explosion, microwave and treatment with zeolites.

Keywords: *Anaerobic digestion, Lignocellulosic substrates, Pre-treatment, Pig manure*