METHANE PRODUCTION BY CO-DIGESTION OF RABBIT WASTE WITH ANIMAL MANURE MIXTURE

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Introduction. Anaerobic digestion (AD) is a process in which organic substrates are degraded in the absence of oxygen by bacterial activities via enzymatic, producing biogas that could be used as a renewable energy source whose main components are methane (CH_4) and carbon dioxide (CO_2). Co-digestion is the simultaneous digestion of a homogenous mixture of two or more substrates. Recently, it has been realized that AD as such became more stable when the variety of substrates applied at the same time is increased. The most common situation is when a major amount of a main basic substrate is mixed and digested together with minor amounts of a single, or a variety of additional substrate (1). The use of co-substrates usually improves the biogas yields from AD due to positive synergisms established in the digestion medium and the supply of missing nutrients by the co-substrates (2). There are works which performs codigestion of two or more waste obtaining good results in methane content (3). The aim of this study was to study the AD process using rabbit waste in co-digestion with animal manure mixture for the methane production.

Methods. Four 120 liters batch digesters of polyethylene were assembled with a working volume of 80 liters at a mesophilic temperature of 25 ± 2 °C, digesters were kept in a greenhouse for 75 days. The digesters were fed with a 90% (weight) of the mixture of organs of rabbits as substrate and 10% (weight) of animal manure (cow (A), swine (B) and goat (C)) as co-substrate to generate a load of 10% total solids. The analyzes were determined every two weeks according to NMX-AA-034-SCFI-2001, volatile solids (VS) and pH. The C/N ratio with a Perkin Elmer 2400 Elemental Analyzer. The production of biogas was measured by "liquid displacement method" (4). the methane content in biogas and volatile fatty acids (VFA) in digestate were determined by gas chromatography (GC).

Results. Fig. 1 shows the behavior of pH, volatile solid in process.

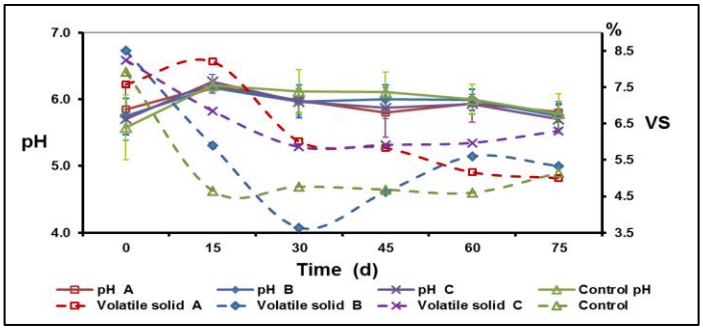

Fig.1. pH/VS ratio

The initial pH was 5.70 to 5.80 and was maintained between 5.7 to 6.3 during the process. Volatile solids had an important decrease in day 30, because they were consumed for the generation of biomass and biogas. Fig. 2 shows the production of methane and volatile fatty acids with major content were butyric acid followed by valeric acid.

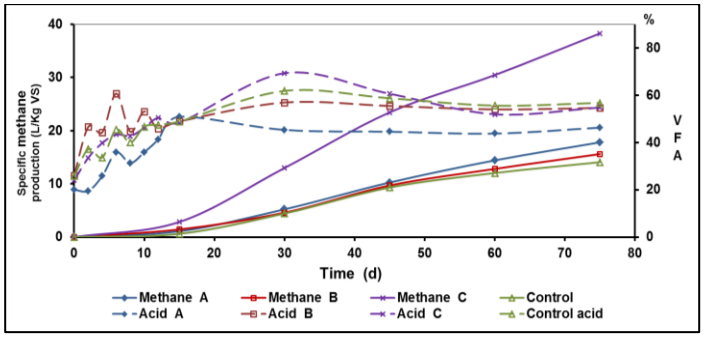

Fig.2. Specific methane production and VFA production.

After day 15 was recorded a high increase in methane. Methane yield was 38.30 for digester with goat manure while digester control was 14.08 L/kg volatile solids consumed.

Conclusions. The most important finding from this research is that the mixture of organs of rabbits used as substrate can produce biogas without animal manure, however the use of them improved the methane content with respect to the control.

The use goat manure was the best in the co-digestion whit the mixture of organs of rabbits for methane production.

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