



BIOGAS PRODUCTION BY CODIGESTION OF TOMATO'S PLANT WASTES AND COW MANURE

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Introduction. Biogas is a renewable energy source whose main components are methane (CH₄) and carbon dioxide (CO₂). It is generated from anaerobic decomposition of organic substrates by a consortium of microorganisms including fermentative, acetogenic bacteria and methanogenic archaea (1). There are works which perform codigestion of two or more agricultural waste obtaining good results in methane content (2). At the end of the anaerobic digestion (AD) is produced a sludge rich in nutrients that can be used as fertilizer (3).

The aim of this study was to study the AD process using the tomato crop residues in codigestion with cow manure to generate biogas, which could be used to warm the green house helping to reduce the costs.

Methods. There were performed three batch anaerobic digesters, with a working volume of 2.4 liters at a mesophilic temperature of 30 ± 2 °C, during two and a half months. The digesters were fed with a 80% (weight percent) tomato crop residues (leaves, stems and tomato) as substrate and 20% (weight percent) of cow dung 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, total solids (TS), volatile solids (VS) and pH. The methane content in biogas and volatile fatty acids (VFA) in digestate were determined by gas chromatography (GC). The final digested sludge was analyzed according to NOM 004-SEMARNAT 2002 for total coliform, fecal coliform, *Salmonella* and phytotoxicity (4).

Results. Fig. 1 shows the behavior of pH, volatile solids, cumulative production of biogas and methane. The initial pH was 6.55 and was maintained between 5.5 to 6 during the process. Volatile solids had an important decrease after day 28, because they were consumed for the generation of biomass and biogas. After day 30 was recorded a high increase in biogas and methane. The total production was 1.7 L of biogas, with 0.71 L of methane. Biogas yield was 85.12 L/kg volatile solids consumed, and for methane was 31.83 L/kg volatile solids consumed.

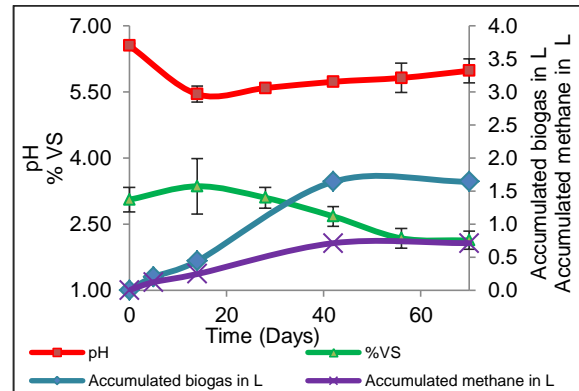


Fig.1. Digester performance, pH, percent volatile solids (VS), production total accumulated of biogas and methane.

The volatile fatty acids with major content were butyric acid followed by valeric acid. The MPN of Total Coliforms in the digestate was 460 and neither Fecal Coliforms or *Salmonella* were detected. The digestate at 5% not present phytotoxicity using lettuce seeds as shown in Figure 2.

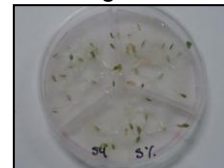


Fig.2. Phytotoxicity tests *Lactuca sativa* seeds, digestate solution 5% (v/v)

Conclusions. It is possible to generate biogas with a methane content of up to 37% from tomato's plant waste in co-digestion with cow dung and the digestate is non phytotoxic.

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