



## **STRATEGY FOR STABILIZING A MICROBIOLOGICAL INOCULUM TO DETERMINE METHANOGENIC ACTIVITY**

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The emission of greenhouse gases (GHG) is linked to the increase of global temperatures. In Brazil, only 1% of all organic waste is reused, much of it is sent to landfills where it is decomposed, releasing methane gas, which is 86 times more polluting than CO<sub>2</sub>. Biogas appears as an alternative, as it promotes the use of organic waste in the anaerobic digestion (AD) process to generate thermal and electrical energy and when purified, as vehicular energy, contributing to the circular economy and GHG mitigation. For a better use of organic matter and effective production of biogas, a balanced inoculum is necessary. The FOS/TAC ratio is an indicator of the good progress of the processes of AD, where: FOS is the content of volatile fatty acids; TAC is the buffer capacity of the sample. The reference value is 0.3 to 0.4. Therefore the objective of this study was to determine metrics for the ideal conditions for a methanogenic inoculum. The inoculums A and B are composed by 50% swine manure and 50% cattle manure, kept in 20 L gallons at a temperature of 37°C. To determine FOS/TAC in both inoculums, a volume of 5 mL was collected and added to 50 mL of distilled water. The samples were titrated with H<sub>2</sub>SO<sub>4</sub> solution (0.05 M) until reaching pH 5.0, to calculate the TAC value. FOS was obtained by a second titration from pH 5.0 to pH 4.4. The inoculum A started with a value of 7.20 and pH 5.43. After a period of 35 days the FOS/TAC ratio reduced to an ideal value of 0.4. Simultaneously, the pH underwent a beneficial increase for methanogenic activity, reaching 8.0. The alkalization of the pH and the decrease in FOS/TAC is due to a stabilized anaerobic process, since the inoculum under these conditions will be favorable for evaluating the biogas production capacity of a waste. The pH of the inoculum B was purposefully adjusted from 5.84 to 8.00 using NaOH (1 M). It was observed that after 3 days, the FOS/TAC value began to decline, from 2.10 to 0.85, not reaching an ideal value. On the 11th day it reached 2.63, exceeding the initial value, showing that pH regulation is a method that does not keep the microbiome stabilized for a long time. Indicating low activity of the microorganisms responsible for AD that use these compounds for their metabolic processes. The use of the FOS/TAC ratio is essential to evaluate the quality of an inoculum and maximize the production of biogas from waste with a high environmental impact.

Palavras-chave: stabilization, Inoculum , Methane

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