

INFLUENCE OF ORGANIC LOADING RATE ON ARCHEA COMMUNITY CONCENTRATION IN A CSTR REACTOR TREATING SWINE MANURE

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Abstract: This study aimed to evaluate the influence of organic loading rate on microorganism acclimation in a CSTR reactor fed with swine manure. The organic loading rate progression was performed by hydraulic retention time (HRT) reduction at the reactor CSTR during 4 steps: Step 1 HRT 35 d, OLR 0.62 gVSL⁻¹d⁻¹; Step 2 HRT 30 d, OLR 0.73 gVSL⁻¹d⁻¹ Step 3 HRT 25 d, OLR 0.56 gVSL⁻¹d⁻¹ and Step 4 HRT 20 d, OLR 1.06 gVSL⁻¹ d⁻¹. Genomic DNA was extracted from CSTR sludge in each studied step using a PowerSoil DNA Isolation kit. Total Archaea, Methanosarcinales and Methanomicrobiales methanogenic 16S rRNA gene copy concentration was estimated by real-time quantitative PCR analysis. The analysis revealed differences in microbial community concentration among the different studied steps. The step 4 presented the greatest biogas stability (total archaea concentration 1.11x10¹² copies.g⁻¹). Methane production in the CSTR reactor was predominantly associated with the hydrogenotrophic methanogens (Methanobacteriales reaching concentration 8.28x10¹⁰ copies.g⁻¹). The hydrogenotrophic methanogens predominance can also be explained by the inhibitory effects by ammonia (Methanosarcinales reaching concentration 5.16x10¹⁰ copies.g⁻¹). There is a correlation between the acclimation process and the increase in the concentration of methanogenic archaea.

Keywords: biogas, archaea, CSTR.



Video presentation