

Bacteria and archaea involved in anaerobic digestion of distillers grains with solubles

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Abstract

Cereal distillers grains, a by-product from bioethanol industry, proved to be a suitable feedstock for biogas production in laboratory scale anaerobic digesters. Five continuously stirred tank reactors were run under constant conditions and monitored for biogas production and composition along with other process parameters. Iron additives for sulfide precipitation significantly improved the process stability and efficiency, whereas aerobic pretreatment of the grains had no effect. The microbial communities in the reactors were investigated for their phylogenetic composition by terminal restriction fragment length polymorphism analysis and sequencing of 16S rRNA genes. The bacterial subcommunities were highly diverse, and their composition did not show any correlation with reactor performance. The dominant phylotypes were affiliated to the Bacteroidetes. The archaeal subcommunities were less diverse and correlated with the reactor performance. The well-performing reactors operated at lower organic loading rates and amended with iron chloride were dominated by acetoclastic methanogens of the genus *Methanosaeta*. The well-performing reactor operated at a high organic loading rate and supplemented with iron hydroxide was dominated by *Methanosarcina* ssp. The reactor without iron additives was characterized by propionate and acetate accumulation and high hydrogen sulfide content and was dominated by hydrogenotrophic methanogens of the genus *Methanoculleus*. © 2010 Springer-Verlag.

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Keywords

Actinomycetales, Biogas, DDGS, Methanogenic archaea, Porphyromonadaceae, T-RFLP