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MICROBIAL COMMUNITY ANALYSIS OF AMBIENT TEMPERATURE ANAEROBIC DIGESTERS

RICHARD CIOTOLA[1]

[1]Department of food, agriculture and biological engineering, Ohio state university, 590 Woody Hayes drive. Columbus, OH 43210, ciotola.7@osu. edu

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ABSTRACT To produce smaller and affordable digesters we modified designs for Chinese and Indian fixed-dome anaerobic digesters. While these types of systems are widespread in tropical regions of developing countries, they have not been implemented in colder climates in part due to the reduction in biogas yield during the winter months. While there is evidence that sufficient biogas production can be maintained in colder temperatures through design and operational changes, there is a lack of knowledge about the seasonal changes in the composition of the microbial communities in ambient temperature digesters. Increased knowledge in this area is necessary to design and operate systems for maximum biogas yield in temperate climates. The goal of this research will be to cultivate a microbial community that maximizes biogas production at psychrophilic temperatures. Microbial community response to ambient temperature changes was investigated using culture-independent methods on weekly samples collected from a 300 gallon experimental anaerobic digester on the campus of Ohio State University. Microbial community profiles were established using universal bacterial and archaeal primers that targeted the 16S rRNA gene. In addition to the methanogenic archaea, our analysis also targeted some of the other numerically and functionally important microbial taxa in anaerobic digesters including hydrolytic, fermentative, acetogenic and sulfate reducing bacteria. Preliminary results suggest a shift in microbial community composition with seasonal temperature variation with a decrease in the diversity of the methanogens. Further investigation into manipulating the composition of microbial communities will follow this preliminary analysis.

Keywords: biogas, anaerobic digestion, psychrophilic, 16S rRNA gene, microbial communities