Renewable Sources of Energy: A Study of Low-Cost By-Products, Cattle Manure and Nitrogen for Methane Gas Conversion Production

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The objective of this experiment is to examine several available, low-cost by-products as substrates for conversion to methane gas. My previous research demonstrated that these materials were degraded to methane; however, I was unable to follow the process in a quantitative manner. Last summer, two University of Wyoming Professors offered to provide access to techniques and laboratory equipment that would allow me to accurately measure the volumes of gas generated in the anaerobic bottles and to analyze gas composition. The substrates evaluated included distiller's dried grain, potato waste by-product, freshwater algae, and sugar beet pellets. Large volumes of gas were produced in the bottles over several weeks; however, all of the gas was carbon dioxide. These results suggested that only the fermentative microorganisms were active. I measured the pH and found it to be too low to support methanogens (< pH 6.8) that convert the fermentation products to methane. Experiments with the same set of substrates were repeated, but with two modifications. Since the nitrogen may be beneficial, one set of bottles contained urea nitrogen. In addition, all bottles were set up with a buffer to prevent pH problems. Results of the new experiments indicate that (1) addition of nitrogen improves gas production, and (2) the substrates are very acidic.

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