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The Effect of Carbon Loading and Fatty Acid Concentration on the Production of Biohydrogen by Anaerobic Fermentation of Agricultural Waste Feedstocks

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Abstract:

Biological hydrogen production through biomass conversion has been the subject of basic and applied research for many years. The development of technology where hydrogen is produced from agricultural biomass through microbial bioprocesses, can help overcome current biohydrogen production limitations and provide a means of reducing agricultural waste. The key problems, substrate inhibition of hydrogen producing reactions and hydrogen consumption by methanogenic microorganisms can be overcome by improved bioreactor design and culture selection. This research addresses the effect of fatty acids and carbon loading on biohydrogen production. Biohydrogen production, using microbial conversion of biomass, is one of the most efficient methods of hydrogen production. The design of a successful bioreactor depends on the ability to develop hydrogenase producing bacteria that are not only stable throughout the conversion of biomass but also carry out hydrogen production in the presence of methanogenic bacteria. This project utilizes switchgrass as the model source of cellulosic hydrogen and cow manure as the source of hydrogenase bacteria and fatty acids. This research integrates existing technology with the development of energy specific crops to develop a novel bioreactor tolerant of the substrates encountered in practical applications.

Impact Statement:

This project will contribute significantly to the energy security of the nation by developing a viable, economically feasible and environmentally friendly alternative fuel source. It will also help reduce agricultural waste.

The major outcome of this project is data on the optimum conditions required to design an efficient biohydrogen reactor based on agricultural feedstocks and livestock waste.

Implementation of this project will also improve the agricultural research infrastructure of SCSU, an 1890 Land grant institution by developing innovative technologies in the production of hydrogen by the anaerobic fermentation of agriculturally derived feedstocks.

Project activities will strengthen the teaching, research and student training capacity of South Carolina State University and the region in the area of agricultural basic sciences.

Category: Other Water Resource Topics
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