Biogas Production From Thermo–Alkaline Pretreated Corn Stover Co-digested with Rumen Content

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Abstract

Lignocellulosic wastes have capacity to substitute fossil fuels as sustainable sources of renewable energy, with added advantage over environmental and health challenges. This research was aimed at producing biogas from anaerobic co-digestion of thermo-alkaline pretreated corn stover with cattle rumen content. The thermal and alkaline pretreatment approaches were intended to render the substrates amenable to microbial biodegradation in the biodigester. Assessment of the microbial succession over the 20-day biodigestion period was done using standard microbiological methods. Results reveal that the pretreated and untreated corn stover showed 45.69% and 14.42% decrease in lignin and hemicelluloses contents, respectively, with a 37.60% increase in cellulose component. Specie of Bacillus, Proteus, Staphylococcus, Enterococcus, Bacteroides, Clostridium, Pseudomonas, Fu sobacterium, Aspergillus, Penicillium, Mucor, and Rhizopus were isolated. A cumulative biogas volume of 54.97 m^3 at a temperature range of 29.8–31.1 °C and alkaline pH of 7.05–7.84 were recorded. This study highlights the possibility of producing biogas from anaerobic co-digestion of thermo-alkaline pretreated corn stover and cattle rumen content. The ready availability of the waste substrates and the high biogas yield recorded show promise as an alternative solution to the global energy need while presenting a waste management strategy with capacity for improved bioeconomy.

Keywords: Biogas Renewable energy Anaerobic digestion Lignocellulosic wastes Corn stover

Rumen content