Fermentative methane production from glycerol

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Abstract

Glycerol (1,2,3-propanetriol) is a waste from biodiesel production. Increasing biodiesel production has caused a surplus of glycerol on global markets. Converting glycerol into value-added chemicals would aid in alleviating this global 'glut'. Producing fuels such as hydrogen and methane from glycerol are possible routes for adding value to glycerol. The current studies focus on fermentative methane production from glycerol.

Screening studies to establish optimal conditions for methane production were conducted at different pH levels (5.5-8.5), initial glycerol concentrations (312-10,000 $mg \cdot l^{-1}$) and varying glucose to glycerol ratios (1:1-1:4). The preliminary data indicate that the optimal pH was 7.6. The optimal initial glycerol concentration for maximum methane production at pH 7.6 was 625 $mg \cdot l^{-1}$. Decreasing methane yields were correlated with increasing the initial glycerol concentration.

In terms of glucose and glycerol as co-substrate, methane production was inhibited in the presence of glucose, while adding glucose boosts the glycerol degradation rate at some extent. A series of experiments was conducted to examine the effect of vitamin B_{12} on methane production using glycerol as substrate. Preliminary results indicate that less methane and more 1,3-PD were produced in cultures containing vitamin B_{12}.

Key words: glycerol, methane production, co-substrate, vitamin B_{12}