

Abstract

Combined effects of different carbon sources on bacterial community structure in hydrogen fermentation.

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H₂ production from waste materials has recently gained much attention in many developing countries due to their enormous benefits as biofuels for domestic and industrial use. In this study, the combined effect of cow-dung (C), fruit (F) and tofu (T) active sludge as inoculum on hydrogen (H₂) fermentation with rotten melon as sole carbon source has been investigated. Batch fermentation of active sludge was performed under strict anaerobic conditions for 7 days. The cumulative H₂ produced and bacterial community structure from the sludge on day 0, day 1 and day 7 were analyzed. Both individual and mixed cultures of active sludge produced H₂ without methane. FCT mixed cultures produced the highest cumulative H₂ among other cultures (1,132 mL, yield 231,02 mL/g). The results of DGGE analysis showed that bacterial community structure had changed based on FCT combination and time of fermentation. *Lactobacillus paracasei* was mostly observed on day 0 and 7 days of fermentation in only mixed cultures. *Clostridium perfringens* were prominently observed on FT, FC and CT mixed cultures respectively. This study could initiate a novel strategy for the maintenance of conditions that favor the growth and activities of *Clostridium perfringens* on FCT mixed cultures.

Keywords: Hydrogen, Active sludge, Clostridium, DGGE

Abstrak

Pengaruh kombinasi sumber karbon yang berbeda terhadap struktur komunitas bakteri di fermentasi hidrogen

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Produksi H₂ dari berbagai macam limbah menarik perhatian peneliti di berbagai negara berkembang karena kelebihanannya sebagai pengganti bahan bakar fosil. Efek kombinasi active sludge dari kotoran sapi (C), limbah buah (F) dan limbah tahu (T) sebagai inokulum untuk fermentasi hidrogen dengan melon busuk sebagai sumber karbon telah diteliti. Fermentasi batch dari kombinasi ketiga limbah tersebut telah dilakukan dalam kondisi anaerob selama 7 hari. Analisis kumulatif H₂ dan struktur komunitas bakteri dari kombinasi ketiga limbah tersebut dianalisis pada hari ke-0, 1 dan 7. Semua kombinasi dapat menghasilkan H₂ tanpa menghasilkan CH₄. Kombinasi FCT menghasilkan kumulatif H₂ paling tinggi diantara kombinasi yang lain ((1,132 mL, yield 231,02 mL/g). Analisis DGGE menunjukkan bahwa struktur komunitas bakteri berubah seiring dengan perubahan kombinasi dan waktu fermentasi. Lactobacillus paracasei dideteksi pada hari ke 0 dan hari ke 7. Clostridium perfringens telah terdeteksi di semua kombinasi. Studi ini dapat digunakan untuk menginisiasi pengaturan kondisi pertumbuhan yang optimal bagi Clostridium perfringens untuk fermentasi hidrogen.

Kata kunci : Hidrogen , Active sludge, Clostridium, DGGE