

Simultaneous enzymatic saccharification and ABE fermentation using pretreated oil palm empty fruit bunch as substrate to produce butanol and hydrogen as biofuel

ABSTRACT

Simultaneous saccharification and acetone–ethanol–butanol (ABE) fermentation was conducted in order to reduce the number of steps involved in the conversion of lignocellulosic biomass into butanol. Enzymatic saccharification of pretreated oil palm empty fruit bunch (OPEFB) by cellulase produced 31.58 g/l of fermentable sugar. This saccharification was conducted at conditions similar to the conditions required for ABE fermentation. The simultaneous process by *Clostridium acetobutylicum* ATCC 824 produced 4.45 g/l of ABE with butanol concentration of 2.75 g/l. The butanol yield of 0.11 g/g and ABE yield of 0.18 g/g were obtained from this simultaneous process as compared to the two-step process (0.10 g/g of butanol yield and 0.14 g/g of ABE yield). In addition, the simultaneous process also produced higher cumulative hydrogen (282.42 ml) than to the two-step process (222.02 ml) after 96 h of fermentation time. This study suggested that the simultaneous process has the potential to be implemented for the integrated production of butanol and hydrogen from lignocellulosic biomass.

Keyword: Biobutanol; Biohydrogen; *Clostridium acetobutylicum*; Saccharification; Lignocellulosic biomass; Simultaneous saccharification fermentation