

Statistical optimization of biobutanol production from oil palm decanter cake hydrolysate by *Clostridium acetobutylicum* ATCC 824

ABSTRACT

Oil palm decanter cake (OPDC) is a potential lignocellulosic biomass for the biofuel industry. The fermentation conditions for biobutanol production using glucose from OPDC hydrolysate by *Clostridium acetobutylicum* ATCC 824 were optimized via response surface methodology (RSM). An analysis of variance (ANOVA) using 2⁶ level factorial was successfully screened. Three significant variables were found to influence the biobutanol yield: glucose concentrations in the OPDC hydrolysate, inoculum sizes, and initial pH. The concentration of yeast extract, however, showed an insignificant effect in this study. The batch fermentation was analyzed using central composite design (CCD), and it yielded significant variables and the predicted optimum conditions were 70.00 g/L of OPDC hydrolysate, 16.20% of inoculum size, and an initial pH of 5.20. The predicted yield of biobutanol was 0.09 g/g using 70.00 g/L of glucose. The optimum conditions were validated, and the actual biobutanol yield was 0.11 g/g with 54.86 g/L of glucose consumption. The biobutanol production using synthetic glucose was 15.38% higher when compared to OPDC hydrolysate, but the utilization of OPDC as alternative substrate was still comparable with other findings.

Keyword: Oil palm decanter cake (OPDC); Biobutanol; 2⁶ Level factorial design; Central composite design (CCD)