

Studi kinetika lipase Whole-Cell *Rhizopus oryzae* terimobilisasi sebagai biokatalis dalam sintesis biodiesel menggunakan rute non-alkohol =  
Kinetic study of immobilized *rhizopus oryzae* whole-cell lipase as biocatalyst in biodiesel synthesis through non alcohol route

Merisa Bestari Faiz, author

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Abstrak

Penggunaan biokatalis whole-cell merupakan cara yang potensial untuk menekan biaya katalis dalam produksi biodiesel yang dikatalis oleh lipase. *Rhizopus oryzae* dikultivasi menggunakan metode one-step dan two-step serta diimmobilisasi dalam biomass support particle (BSP) dan bead kitosan-TPP. Whole-cell yang terimobilisasi pada BSP menghasilkan yield metil ester 11% (one-step) dan 12% (two-step). Sementara itu, yield metil ester yang dihasilkan whole-cell yang terimobilisasi pada bead kitosan-TPP adalah 23% (one-step) dan 22% (two-step). Model Michaelis-Menten yang digunakan mampu menggambarkan profil konsentrasi substrat dan produk yang dihasilkan. Nilai  $K_m$  dan  $V_{max}$  untuk whole-cell yang terimobilisasi pada BSP adalah 4 mol L<sup>-1</sup>, 0,05 mol L<sup>-1</sup> jam<sup>-1</sup> (one-step) dan 3 mol L<sup>-1</sup>, 0,04 mol L<sup>-1</sup> jam<sup>-1</sup> (two-step). Sementara itu, whole-cell yang terimobilisasi pada bead kitosan-TPP memiliki nilai  $K_m$  dan  $V_{max}$  yang sama, 0,3 mol L<sup>-1</sup>, 0,01 mol L<sup>-1</sup> jam<sup>-1</sup> yaitu meski dikultivasi dengan metode yang berbeda.

.....Utilizing whole-cell biocatalyst is a potential way to reduce catalyst cost in biodiesel production using lipase as catalyst. Whole-cell of *Rhizopus oryzae* was cultivated by one-step and two-step method and was immobilized on Biomass Support Particles (BSPs) and chitosan-TPP bead. Immobilized whole-cells on BSPs produce 11% (one-step) and 12% (two-step) FAME yield. While, FAME yield produced by immobilized whole-cell in chitosan-TPP beads are 23% (one-step) and 22% (two-step). Kinetic model based Michaelis-Menten used was found to fit fairly the substrate and product concentration profile. Value of  $K_m$  and  $V_{max}$  for *R. oryzae* whole-cell immobilized on BSP are 4 mole L<sup>-1</sup>, 0.05 mole L<sup>-1</sup> h<sup>-1</sup> (one-step) and 3 mole L<sup>-1</sup>, 0.04 mol L<sup>-1</sup> h<sup>-1</sup> (two-step). While, for immobilized whole-cell in chitosan-TPP bead, the values are 0,3 mole L<sup>-1</sup>, 0,01 mole L<sup>-1</sup>h<sup>-1</sup> and 0,2 mole L<sup>-1</sup>, 0,008 mole L<sup>-1</sup>h<sup>-1</sup> for single-step and two-step respectively.