

# Studi optimasi esterifikasi asam lemak hasil hidrolisis minyak sawit dengan glukosa menggunakan lipase candida rugosa E.C. 3.1.1.3 terimobilisasi pada nanopartikel Fe<sub>3</sub>O<sub>4</sub>-Kitosan = Optimization study of esterification between palm oil fatty acid and glucose by using immobilized candida rugosa lipase E.C. 3.1.1.3 on Fe<sub>3</sub>O<sub>4</sub>-Chitosan nanoparticles

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## Abstrak

Reaksi esterifikasi antara glukosa dengan asam lemak dapat menghasilkan ester asam lemak-glukosa. Pada penelitian ini, asam lemak diperoleh dari reaksi hidrolisis minyak kelapa sawit yang dijual dipasaran. Reaksi esterifikasi dilakukan secara enzimatik menggunakan katalis lipase Candida rugosa E.C.3.1.1.3 terimobilisasi pada nanopartikel Fe<sub>3</sub>O<sub>4</sub>-Kitosan. Nanopartikel Fe<sub>3</sub>O<sub>4</sub>- Kitosan disintesis dengan metode kopresipitasi kemudian dilakukan karakterisasi dengan FTIR (Fourier Transform Infra Red), XRD (X-Ray Diffraction), dan EDS (Energy Dispersive X-Ray Spectroscopy). Imobilisasi lipase Candida rugosa pada nanopartikel Fe<sub>3</sub>O<sub>4</sub>-Kitosan menggunakan metode ikat silang dengan glutaraldehida sebagai agen pengikat silang. Hasil imobilisasi dilakukan uji aktivitas dan persen loading. Persen loading imobilisasi lipase yang diperoleh adalah 62,20% dan aktivitas hidrolisis lipase terimobilisasi sebesar 6,18 U/mL dan aktivitas spesifiknya sebesar 2,65 U/mg serta efisiensi imobilisasi sebesar 34,54%. Dari hasil optimasi esterifikasi diperoleh persen konversi optimum sebesar 3,70 % dengan kondisi reaksi pada suhu 35°C , ratio glukosa : asam lemak 1 : 90, dan waktu reaksi selama 16 jam dan 40% massa enzim terimobilisasi.

*Esterification reaction between glucose and fatty acid could produce glucose-fatty acid esters. In this study, fatty acid was synthesized from hydrolysis reaction of palm oil. Esterification reaction was carried out enzymatically using immobilized Candida rugosa lipase EC.3.1.1.3 on Fe<sub>3</sub>O<sub>4</sub>-chitosan nanoparticles. Fe<sub>3</sub>O<sub>4</sub>-chitosan nanoparticles was synthesized using co-precipitation method and was characterized using FTIR (Fourier Transform Infra Red), XRD (X-Ray Diffraction), and EDS (Energy Dispersive X-Ray Spectroscopy). Candida rugosa lipase was immobilized on Fe<sub>3</sub>O<sub>4</sub>-chitosan nanoparticles using cross-linking method with glutaraldehyde as cross linker. Loading percentage of immobilized lipase was 62,20%. Hydrolysis activity of immobilized lipase was 6,81 U/mL, the specific activity was 2,65 U/mg and the immobilization efficiency was 34,54%. From this optimization study of esterification, the highest fatty acid conversion percentage was obtained using 1 : 90 ratio of glucose : fatty acid, 16 hours reaction time, immobilized lipase 40% of substrate's mass, and at temperature 35°C. The highest fatty acid conversion percentage was 3,70%.*