

Pengaruh pelarut terhadap transesterifikasi dan interesterifikasi minyak kelapa sawit menggunakan lipase candida rugosa terimobilisasi pada partikel nano Fe₃O₄-polidopamin = The effect of solvents on transesterification and interesterification from palm oil using immobilized lipase candida rugosa on Fe₃O₄ polydopamine nanoparticles

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Abstrak

Etil ester asam lemak dapat diperoleh melalui reaksi transesterifikasi dan interesterifikasi minyak sawit. Reaksi transesterifikasi dan interesterifikasi dilakukan secara enzimatis menggunakan lipase *Candida rugosa* bebas dan yang terimobilisasi pada partikel nano Fe₃O₄-polidopamin. Nilai persen loading imobilisasi yang diperoleh adalah 78%. Lipase bebas memiliki aktivitas spesifik sebesar 13,81 U/mg, sedangkan lipase terimobilisasi sebesar 2,86 U/mg. Lipase imobilisasi memberikan efisiensi sebesar 21% dengan penurunan aktivitas 79%. Partikel Nano Fe₃O₄-Polidopamin dan lipase terimobilisasi dikarakterisasi menggunakan FTIR, FESEM, EDS, PSA, dan XRD. Pelarut yang digunakan pada reaksi transesterifikasi dan interesterifikasi yaitu t-butanol, metil isobutil keton, dan n-heksan. Hasil etil ester asam lemak dianalisis dengan GC-FID. Persen komposisi tertinggi pada transesterifikasi dengan katalis lipase bebas dan lipase terimobilisasi sebesar 5,59% dan 3,21% dalam pelarut metil isobutil keton. Sementara itu, Persen komposisi tertinggi pada interesterifikasi dengan katalis lipase bebas dan lipase terimobilisasi sebesar 2,15% dan 1,46% dengan pelarut metil isobutil keton. Enzim terimobilisasi dalam reaksi transesterifikasi dan interesterifikasi dapat digunakan tiga kali pengulangan. Setelah tiga kali pengulangan, aktivitas menurun 61%. Transesterifikasi dan interesterifikasi berlangsung dalam pelarut metil isobutil keton.

*Fatty acid ethyl ester is produced by either transesterification and interesterification between palm oil and ethanol or ethyl acetate as reactants. Transesterification and interesterification were enzyme-catalyzed using immobilized *Candida rugosa* lipase on Fe₃O₄-polydopamine. Loading percentage of immobilized lipase was 78%. Free lipase had specific activity about 13.81U/mg, while immobilized lipase of 2.86 U/mg. Immobilization lipase gave efficiency of 21% with a decrease in the specific activity of 79%. Fe₃O₄-polydopamine nanoparticle have been characterized using FTIR, FESEM, EDS, PSA, and XRD. Variation of solvents used for reaction were t-butanol, methyl isobutyl ketone, and n-hexane. Analysis of fatty acid ethyl ester was performed by GC-FID. The highest composition of transesterification using free lipase and immobilized lipase, with methyl isobutyl ketone as solvent, were 5.59% and 3.21%, respectively. Meanwhile, highest composition percentage of interesterification using free lipase and immobilized lipase were 2.15% and 1.46%, using methyl isobutyl ketone. Immobilized enzyme in transesterification and interesterification can use three times recycle. After third recycle, the presentation of relative activity decreased 61%. Transesterification and interesterification took place in methyl isobutyl ketone as solvent.*