ABSTRAK

IMOBILISASI ENZIM LIPASE DARI BAKTERI *Pseudomonas* sp. LPG171 DENGAN MATRIKS ZEOLIT ALAM TERAKTIVASI

Oleh

Bunga Mega Nurlinda

Imobilisasi enzim dilakukan untuk meningkatkan stabilitas enzim dengan mengurangi kelarutan enzim dalam air karena pergerakan molekul enzim yang ditahan dengan matriks yang tidak larut dalam air seperti zeolit. Dalam penelitian ini dilakukan imobilisasi enzim lipase dari bakteri *Pseudomonas* sp. LPG171. Tahapan penelitian yang dilakukan meliputi produksi enzim, pemurnian ekstrak kasar enzim, imobilisasi, karakterisasi enzim terimobilisasi dan penggunaan berulang enzim terimobilisasi. Aktivitas hidrolisis ditentukan dengan metode *Kwon and Rhee* dengan substrat minyak zaitun sementara aktivitas transester ditentukan dengan metode *Fuu* dengan substrat *P-Nitrofenol Palmitat*.

Hasil penelitian menunjukkan bahwa enzim hasil pemurnian memiliki aktivitas spesifik 22,29 kali lebih tingi yaitu 480,44 U/mg dibandingkan ekstrak kasar enzim yang memiliki aktivitas spesifik sebesar 21,25 U/mg. Imobilisasi enzim lipase secara keseluruhan tidak mengubah kondisi optimum kecuali aktivitas optimum lipase terimobil pada suhu 40°C, 5°C lebih tinggi dibandingkan suhu optimum enzim bebas. Enzim lipase yang telah terimobilisasi dengan zeolit alam teraktivasi memiliki kondisi optimum pada aktivitas transester yang berada pada pH 7, suhu 40°C, dan waktu inkubasi 10 menit. Berdasarkan hasil yang diperoleh enzim lipase terimobil dengan zeolit alam teraktivasi memiliki aktivitas awal sebesar 132,40 U/ mL namun setelah pemakaian yang ke-5 kali reaksi transesterifikasi aktivitas enzim lipase terimobil mengalami penurunan sebesar 60 U/mL yang mana hal ini menunjukkan enzim lipase terimobil telah kehilangan aktivitasnya sebesar 43,31%.

Kata kunci: *Pseudomonas* sp., lipase, imobilisasi, dan zeolit alam.

ABSTRACT

IMMOBILIZATION OF LIPASE FROM *Pseudomonas* sp. LPG171 WITH ACTIVATED NATURAL ZEOLITE MATRIX

By

Bunga Mega Nurlinda

Enzyme immobilization is carried out to improve enzyme stability by reducing the solubility of enzymes in water due to the movement of enzyme molecules that are held in water-insoluble matrices such as zeolites. In this study, the enzyme lipase was immobilized from the bacterium *Pseudomonas* sp. LPG171. The stages of research conducted included enzyme production, purification of raw enzyme extracts, immobilization, characterization of immobilized enzymes, and repeated suspension of the immobilized enzymes. The hydrolysis activity is determined by the Kwon and Rhee method with an olive oil substrate, while the transester activity is measured by the Fuu method with the P-Nitrophenol Palmitat substrat. The results showed that purification enzymes have a 22.29 times higher specific activity of 480.44 U/mg compared to raw enzyme extracts that have a 21.25 U/ mg specific activity. The overall immobilization of the lipase enzyme does not alter the optimal condition unless the optimum activity of the movable lipase is at a temperature of 40°C, 5°C higher than the optimal temperature of the free enzyme. The enzyme lipase that has been immobilized with the activated natural zeolite has optimum conditions for transester activity at pH 7, temperature 40°C, and incubation time of 10 minutes. Based on the results obtained, the enzyme lipase mobilized with activated natural zeolite has an initial activity of 132.40 U/ mL but after the fifth use the transesterification reaction activity of the enzyme lipase movable has decreased by 60 U/mL which indicates that the activated lipase enzyme has lost its activity by 43.31%.

Key words: *Pseudomonas* sp., lipase, immobilization, and natural zeolite.