ABSTRAK

AMOBILISASI ENZIM α-AMILASE DARI *Bacillus subtilis* ITBCCB148 MENGGUNAKAN BENTONIT

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Pada penelitian ini telah dilakukan amobilisasi enzim α-amilase dari *Bacillus subtilis* ITBCCB148 menggunakan matriks bentonit. Penelitian ini bertujuan untuk meningkatkan kestabilan enzim dan agar enzim dapat digunakan secara berulang. Tahap penelitian ini meliputi proses produksi, isolasi, pemurnian, amobilisasi, dan karakterisasi enzim murni dan amobil. Hasil penelitian menunjukkan bahwa aktivitas spesifik enzim α-amilase hasil pemurnian hingga tahap kromatografi penukar kation menggunakan CMC adalah 10387,11 U mg^{-1} dan kemurniannya meningkat 12 kali dibandingkan dengan ekstrak kasar enzim. Enzim α-amilase hasil pemurnian memiliki suhu optimum 60^{o}C, K_M = 6,18 mg mL^{-1} substrat, dan V_{maks} = 909,09 µmol mL^{-1} $menit^{-1}$. Enzim α-amilase hasil amobilisasi memiliki suhu optimum 75^{o}C, K_M = 12,19 mg mL^{-1} substrat, dan V_{maks} = 88,50 µmol mL^{-1} $menit^{-1}$. Aktivitas sisa enzim murni dan enzim amobil dalam uji stabilitas termal pada suhu 60^{o}C selama 100 menit berturut-turut sebesar 12% dan 43%. Enzim amobil dapat digunakan berulang hingga 5 kali. Data kinetika enzim hasil pemurnian diperoleh $t_{½}$ = 42,00 menit, k_i = 0,0165 $menit^{-1}$, dan ΔG_i = 104,57 kJ mol^{-1}. Data kinetika enzim hasil amobilisasi diperoleh $t_{½}$ = 88,85 menit, k_i = 0,0078 $menit^{-1}$, dan ΔG_i yaitu 106,65 kJ mol^{-1}. Berdasarkan penurunan nilai k_i, peningkatan nilai ΔG_i dan waktu paruh ($t_{½}$), diketahui bahwa amobilisasi menggunakan bentonit dapat meningkatkan stabilitas enzim α-amilase dari *B. subtilis* ITBCCB148.

Kata kunci: α-amilase, *Bacillus subtilis* ITBCCB148, amobilisasi, bentonit

ABSTRACT

THE IMMOBILIZATION OF α-AMYLASE FROM *Bacillus subtilis* ITBCCB148 BY USING BENTONITE

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In this study, the α-amylase from *Bacillus subtilis* ITBCCB148 was immobilized by using bentonite. The aims of this research were to increase the stability of α-amylase and to help in their economic reuse. The steps of this research were done as following: production, isolation, purification, immobilization, and characterization of purified and immobilized enzymes. The result showed that the purified enzyme from CMC cation column chromatography process has specific activity was 10387.11 U mg^{-1}. It was higher 12 times than the crude extract. The optimum temperature of purified enzyme was 60^{o}C, K_M = 6.18 mg mL^{-1} substrate, and V_{max} = 909.09 µmol mL^{-1} min^{-1}. The optimum temperature of immobilized enzyme was 75^{o}C, K_M = 12.19 mg mL^{-1} substrate, and V_{max} = 88.50 µmol mL^{-1} min^{-1}. Residual activities of purified and immobilized enzyme in the study of thermal stability on 60^{o}C for 100 minutes approximately were 12% and 43%. The activity of immobilized enzyme was maintained significantly even after 5 reuses. The kinetic studies of purified enzyme were obtained $t_{½}$ = 42.00 minutes, k_i = 0.0165 min^{-1}, and ΔG_i = 104.57 kJ mol^{-1}. The kinetic studies of immobilized enzyme were obtained $t_{½}$ = 88.85 minutes, k_i = 0.0078 min^{-1}, and ΔG_i = 106.65 kJ mol^{-1}. Based on the increase of half-time ($t_{½}$), decrease of k_i, and increase of ΔG_i, the immobilization by using bentonite can improve the stability of α-amylase from *B. subtilis* ITBCCB148.

Keywords: α-amylase, *Bacillus subtilis* ITBCCB148, immobilization, bentonite