ABSTRAK

PENINGKATAN KESTABILAN ENZIM α-AMILASE DARI *Aspergillus fumigatus* DENGAN PENAMBAHAN POLIETILEN GLIKOL (PEG) 6000

Oleh

EKA CANDRA WATI

Enzim banyak digunakan dalam kegiatan industri, namun untuk industri di Indonesia kebutuhan enzim belum dapat terpenuhi sehingga harus mengimpor enzim. Salah satu enzim yang memiliki peran penting ialah enzim α-amilase. Penelitian ini bertujuan untuk meningkatkan kestabilan enzim α-amilase dari *A. fumigatus* dengan cara penambahan polietilen glikol (PEG) 6000. Tahapan penelitian yang dilakukan yaitu: produksi, isolasi, pemurnian, dan karakterisasi. Aktivitas enzim α-amilase ditentukan menggunakan metode Fuwa dan Mandels, serta kadar protein ditentukan dengan metode Lowry. Hasil penelitian menunjukkan aktivitas spesifik enzim hasil pemurnian sebesar 753,83 U/mg yang mengalami peningkatan kemurnian 15 kali dibandingkan dengan ekstrak kasarnya 51,97 U/mg. Enzim hasil pemurnian mempunyai suhu optimum 50°C dan pH optimum 5; uji stabilitas termal pada suhu 50°C mempunyai nilai k_i = 0,0389 ± 0,0001 menit^{-1}; $t_{1/2}$ = 17,42 ± 0,06 menit; ΔG_i = 102,136 ± 0,003 kJ mol^{-1}. Enzim setelah penambahan PEG 6000 konsentrasi 20, 25, dan 30% memiliki suhu optimum 55ºC dan pH optimum 6; uji stabilitas termal enzim setelah penambahan PEG 6000 konsentrasi 20, 25, dan 30% pada suhu 55°C mempunyai nilai k_i = 0,0058 ± 0,0000; 0,0076 ± 0,0001; dan 0,0077 ± 0,0001 menit^{-1}; $t_{1/2}$ = 119,51 ± 0,00; 90,61 ± 0,84; dan 90,03 ± 1,65 menit; dan nilai ΔG_i = 107,468 ± 0,00; 106,702 ± 0,01; dan 106,684 ± 0,02 kJ mol^{-1}. Penambahan PEG 6000 dapat meningkatkan kestabilan enzim α-amilase dari *A. fumigatus* 6,86 ± 0,02 kali dibandingkan enzim hasil pemurnian, ditunjukkan dengan terjadinya penurunan nilai k_i, peningkatan $t_{1/2}$ dan ΔG_i dari enzim setelah penambahan PEG 6000.

Kata kunci: α-amilase, PEG 6000, kestabilan enzim, dan *A. fumigatus*

ABSTRACT

INCREASED STABILITY OF α-AMYLASE FROM *Aspergillus fumigatus* WITH ADDITION OF POLYETYLENE GLICOL (PEG) 6000

By

EKA CANDRA WATI

Enzymes are widely used in industrial activities, but for industry in Indonesia the need for enzymes can't be fulfilled, so they have to import enzymes. One of the enzymes that have an important role is the α-amylase. This study aims to increase the stability of the α-amylase enzyme from *A. fumigatus* by adding polyethylene glycol (PEG) 6000. The stages of the research carried out were the production, isolation, purification, and characterization. The α-amylase enzyme activity was evaluated using the Fuwa and Mandels method, and the protein content was evaluated using the Lowry method. The results of the research showed the specific activity of the purified enzyme was 753.83 U/mg which increased 15 times in purity compared to the crude extract, which was 51.97 U/mg. The purified enzyme has an optimum temperature of 50°C and an optimum pH of 5, test the thermal stability at 50°C has a value of k_i = 0.0389 min^{-1} ± 0.0001; $t_{1/2}$ = 17.42 ± 0.06 min; ΔG_i = 102.136 ± 0.003 kJ $mole^{-1}$. Enzymes after the additionof PEG 6000 concentration of 20, 25, and 30% have an optimum temperature of 55°C and optimum pH of 6; test the thermal stability of the enzyme after addition of PEG 6000 concentration of 20, 25, and 30% at 55°C has a value of k_i = 0.0058 ± 0.0000; 0.0076 ± 0.0001; and 0.0077 ± 0.0001 min^{-1}; $t_{1/2}$ = 119.51 ± 0.00; 90.61 ± 0.84; and 90.03 ± 1.65 min; and value ΔG_i = 107.468 ± 0.00; 106.702 ± 0.01; and 106.684 ± 0.02 kJ mol^{-1}. The addition of PEG 6000 was able to increase the stability of the α-amylase from *A. fumigatus* 6.86 ± 0.02 times compared to the purified enzymes, indicated by a decrease in the k_i value, an increase in the $t_{1/2}$ and ΔG_i of the enzyme after the addition of PEG 6000.

Keywords: α-amylase, PEG 6000, enzyme stability, and *A. fumigatus*