

ABSTRAK

STUDI PENGARUH PENAMBAHAN GLISEROL DAN SORBITOL TERHADAP STABILITAS ENZIM SELULASE DARI *Bacillus subtilis* ITBCCB148

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Penelitian ini bertujuan untuk mempelajari pengaruh penambahan gliserol dan sorbitol terhadap stabilitas enzim selulase dari *Bacillus subtilis* ITBCCB148. Untuk mencapai tujuan tersebut dilakukan produksi, isolasi, dan pemurnian enzim. Pemurnian enzim selulase dilakukan dengan menggunakan kromatografi kolom filtrasi gel Sephadex G-100. Enzim hasil pemurnian kemudian ditambahkan gliserol dan sorbitol. Penentuan aktivitas enzim selulase dilakukan dengan metode Mandels sedangkan pengukuran kadar protein dilakukan dengan metode Lowry.

Hasil penelitian menunjukkan bahwa enzim hasil pemurnian memiliki aktivitas spesifik sebesar 4,6458 U/mg, meningkat 4,93 kali dibandingkan ekstrak kasar enzim dengan perolehan 12,60%. Enzim ini memiliki pH optimum 5,5; suhu optimum 50°C; $k_i = 0,0121 \text{ menit}^{-1}$; $t_{1/2} = 57,27 \text{ menit}$; dan $G_i = 102,19 \text{ kJ mol}^{-1}$.

Enzim setelah penambahan gliserol 0,5; 1,0; dan 1,5 M memiliki pH optimum dan suhu optimum yang sama dengan enzim hasil pemurnian. Uji stabilitas termal enzim setelah penambahan gliserol 0,5 M pada suhu 50°C selama 100 menit memiliki $t_{1/2} = 72,19 \text{ menit}$, $k_i = 0,0096 \text{ menit}^{-1}$ dan $G_i = 102,82 \text{ kJ mol}^{-1}$; gliserol 1,0 M memiliki $t_{1/2} = 82,50 \text{ menit}$, $k_i = 0,0084 \text{ menit}^{-1}$ dan $G_i = 103,17 \text{ kJ mol}^{-1}$; dan gliserol 1,5 M memiliki $t_{1/2} = 80,58 \text{ menit}$, $k_i = 0,0086 \text{ menit}^{-1}$ dan $G_i = 103,11 \text{ kJ mol}^{-1}$.

Enzim setelah penambahan sorbitol 0,5; 1,0; dan 1,5 M memiliki pH optimum dan suhu optimum yang sama dengan enzim hasil pemurnian. Uji stabilitas termal enzim setelah penambahan sorbitol 0,5 M pada suhu 50°C selama 100 menit memiliki $t_{1/2} = 90,00 \text{ menit}$, $k_i = 0,0077 \text{ menit}^{-1}$ dan $G_i = 103,41 \text{ kJ mol}^{-1}$; sorbitol 1,0 M memiliki $t_{1/2} = 99,00 \text{ menit}$, $k_i = 0,0070 \text{ menit}^{-1}$ dan $G_i = 103,66 \text{ kJ mol}^{-1}$; dan sorbitol 1,5 M memiliki $t_{1/2} = 92,40 \text{ menit}$, $k_i = 0,0075 \text{ menit}^{-1}$ dan $G_i = 103,48 \text{ kJ mol}^{-1}$.

Walaupun suhu optimum dan pH optimum enzim setelah penambahan gliserol dan sorbitol tidak mengalami perubahan, tetapi terjadi peningkatan stabilitas termal karena adanya penurunan nilai k_i serta peningkatan waktu paruh dan G_i .

Kata Kunci: Enzim selulase, gliserol, sorbitol, *Bacillus subtilis* ITBCCB148

ABSTRACT

STUDY THE EFFECT OF ADDITION GLYCEROL AND SORBITOL TOWARD STABILITY OF CELLULASE ENZYME FROM *Bacillus subtilis* ITBCCB148

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This research aims to study the effect of addition glycerol and sorbitol toward stability cellulase enzyme from *Bacillus subtilis* ITBCCB148. To approach this aims, the production, isolation and purification of the enzyme were done. The purification of cellulase enzyme was done by using gel filtration chromatography column of Sephadex G-100. The pure enzyme is added by glycerol and sorbitol. Determination of cellulase enzyme activity performed by the method of Mandels while the measurement of protein levels performed by the method of Lowry.

The results showed that the pure enzyme has specific activity 4,6458 U/mg, the pureness increase 4,93 times than native enzyme with the result 12,60%. This enzyme has optimum pH 5,5; optimum temperature 50°C; $k_i = 0,0121 \text{ min}^{-1}$; $t_{1/2} = 57,27 \text{ min}$; and $G_i = 102,19 \text{ kJ mol}^{-1}$.

Enzyme after addition glycerol 0,5; 1,0; and 1,5 M have optimum pH and temperature same with pure enzyme. The test of thermal stability of the enzyme after addition glycerol 0,5 M at temperature 50°C for 100 min has $t_{1/2} = 72,19 \text{ min}$, $k_i = 0,0096 \text{ min}^{-1}$ and $G_i = 102,82 \text{ kJ mol}^{-1}$; glycerol 1,0 M has $t_{1/2} = 82,50 \text{ min}$, $k_i = 0,0084 \text{ min}^{-1}$ and $G_i = 103,17 \text{ kJ mol}^{-1}$; and glycerol 1,5 M has $t_{1/2} = 80,58 \text{ min}$, $k_i = 0,0086 \text{ min}^{-1}$ and $G_i = 103,11 \text{ kJ mol}^{-1}$.

Enzyme after addition sorbitol 0,5; 1,0; and 1,5 M have optimum pH and temperature same with pure enzyme. The test of thermal stability of the enzyme after addition sorbitol 0,5 M at temperature 50°C for 100 min has $t_{1/2} = 90,00 \text{ min}$, $k_i = 0,0077 \text{ min}^{-1}$ and $G_i = 103,41 \text{ kJ mol}^{-1}$; sorbitol 1,0 M has $t_{1/2} = 99,00 \text{ min}$, $k_i = 0,0070 \text{ min}^{-1}$ and $G_i = 103,66 \text{ kJ mol}^{-1}$, and sorbitol 1,5 M has $t_{1/2} = 92,40 \text{ min}$, $k_i = 0,0075 \text{ min}^{-1}$ and $G_i = 103,48 \text{ kJ mol}^{-1}$.

Although the optimum pH and temperature of the enzyme after addition glycerol and sorbitol have not changed, but an increase in thermal stability due to a decrease in the value of k_i as well as increase half life and G_i .

Key word: Cellulase enzyme, glycerol, sorbitol, *Bacillus subtilis* ITBCCB148