Properties of commercial CGTase in enzymatic production of cyclodextrin from ungelatinized sago starch

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Abstrak

Cyclodekstrin glucanotranferase (CGTase) merupakan enzim yang mengkatalis produksi cyclodekstrin (CD). Penelitian ini menggunakan satu enzim CGTase komersial (Toruzyme M) yang dihasilkan secara rekayasa genetika menggunakan bakteri Bacillus yang telah disisipkan gen GTase dari bakteri termofilik Thermoanaerobbacter. Walaupun enzim in dapat menghasilkan alpa, beta, dan gamma siklodekstrin (a-CD, 0-CD, ^-CD), namun beta siklodekstrin merupakan produk terbesar. Hasil penelitian memperlihatkan bahwa reaksin enzim CGTase ini dengan pati sagu mentah sangat berbeda jika menggunakan pati sagu tergelatinkan. Temperatur anneling dan temperatur reaksi enzimatik dhetepkan pada 65°C. Kondisi optimum diperoleh pada pH 9 (bufer glisin-NaOH 0.05M), 15% (b/v) pati sagu dan 0.5% konsentrasi enzim. Total siklodekstrin maksimum (13.17 g/L) diperoleh selama 4 jam pada kelajuan agitasi 200 rpm.dengan perbandingan produk adalah 28%: 64%: 8% masing-masing untuk or-CD: /?-CD: y-CD. Adanya CuSO4, FeSO4 and Co(N03)2 didalam substrat mampu menghambat aktivitas enzim secara keseluruhan sedangan pemberian n-pentene dan etanol akan menghasilkan a-CD sebagai produk utama. Nilai Kmax dan Km CGTase Toruzyme?adalah 0.09 s /?-CD/min and 16.695 %(w/v), secara berurutan.
<hr>Cyclodextrin glucanotransferase (CGTase) is (he enzyme catalyzing the production of cyclodextrin (CD). This study was conducted using a commercial CGTase enzyme (ToruzymeT) produced from genetically modified strain of Bacillus carrying the CGTase gene of Thermoanaerobbacter. Although this enzyme catalyses the formation of alpha, beta and gamma cyclodextrin from starch but beta-cyclodextrin is the major product. The result showed that the reaction behavior of the enzyme on ungelatinized sago starch was markedly different when compared with its reaction to gelatinized starch. Ungelatinised sago starch was annealed and reacted at 6S°C. The optimum condition for the reaction occurred at pH 9 (0.05M Glycine-NaOH buffer) with concentration enzyme and sago starch was 0.5%(v/v)and 15 %(w/v), respectively. The highest amount of total cyclodextrin (13.17 g/L) was produced when the reaction mixture was agitated at 200 rpm for 4 hours consisting of a-CD: /J-CD: y-CD at ratios of 28: 64: 8. The CGTase lost almost all its dextrinizing activity in the presence CuSO4, FeSO4 and Co(NO3)2 in substrate. Addition of n-pentane and ethanol to the reaction mixture, shifted the reaction toward an increased of yield of a-cyclodextrin and eventually becoming the main product of the reaction. The Kmax and Km value of CGTase Toruzyme? were 0.09 g /?-CD/min and 16.695 %(w/v), respectively.