Studi awal stabilitas dan aktivitas Enzim Candida rugosa Lipase Terimobilisasi pada Celite dengan pelarut etanol = Preliminary study of the stability and activity of Immobilized Candida Rugosa Lipase on Celite with ethanol solvent

Lathiifah Alyaa Yudhana, author

Abstrak

Lipase merupakan enzim yang umum diaplikasikan sebagai katalis, baik pada industri pangan maupun proses sintesis bioplastik, seperti Poli Asam Laktat (PLA), dimana lipase Candida rugosa (CRL) menjadi salah satu jenis enzim lipase yang banyak digunakan. Namun, tingginya suhu operasi pada industri maupun sintesis bioplastik dapat mendenaturasi enzim sehingga mempengaruhi aktivitas karena terjadinya perubahan struktur enzim. Proses imobilisasi CRL dapat dilakukan guna meningkatkan stabilitas termal enzim. Pada penelitian ini proses imobilisasi dilakukan melalui metode adsorpsi pada matriks pendukung padat, yaitu Celite. Imobilisasi enzim melalui metode adsorpsi dipengaruhi oleh kondisi operasinya, seperti waktu, suhu, dan pH imobilisasi. Penelitian ini dilakukan dengan beberapa variasi, yaitu jenis larutan pencuci, konsentrasi enzim, suhu imobilisasi, waktu imobilisasi, pH imobilisasi, dan rasio pelarut terhadap buffer. Analisis enzim terimobilisasi dilakukan terhadap aktivitas esterifikasi, stabilitas termal, dan kandungan proteinnya. Penelitian menunjukkan jenis larutan pencuci, konsentrasi enzim, suhu imobilisasi, waktu imobilisasi, pH imobilisasi, dan rasio pelarut terhadap buffer dengan hasil optimal adalah etanol; 35 mg/mL; 60 menit; 6,5; dan 2,75 (v/v) secara berturut-turut. Enzim terimobilisasi pada penelitian ini menghasilkan aktivitas esterifikasi 76% lebih tinggi daripada enzim bebas pada suhu 37°C. Imobilisasi juga meningkatkan stabilitas termal enzim sebesar 29-51% pada suhu esterifikasi tertentu.

.....Lipase is an enzyme that is commonly applied as a catalyst, both in the food industry and in the synthesis of bioplastics, such as Poly Lactic Acid (PLA), where Candida rugosa lipase (CRL) is one of the widely used lipases. However, high operating temperatures in industry and bioplastic synthesis can denature enzymes, thereby affecting activity due to changes in enzyme structure. The CRL immobilization process can be carried out to improve the thermal stability of the enzyme. In this study, the immobilization process was done through the adsorption method on a solid support matrix, that is Celite. Enzyme immobilization through the adsorption method is influenced by its operating conditions, such as time, temperature, and pH of immobilization. The study was carried out by varying the washing solution type, enzyme concentrations, immobilization temperatures, immobilization time, immobilization pH, and the ratio of solvent to buffer. The immobilized enzyme analysis was performed on the esterification activity, thermal stability, and protein content. The study showed that the washing solution type, enzyme concentration, immobilization temperature, immobilization time, immobilization pH, and the ratio of solvent to buffer with optimal results were ethanol, 35 mg/mL, 60 minutes, 6.5, and 2.75 (v/v) respectively. The immobilized enzyme in this study resulted in 76% higher esterification activity than the free enzyme at 37°C. Immobilization also increases the thermal stability of the enzyme by 29-51% at a certain esterification temperature.