

Explore the characteristics of L-fucose isomerase from different sources

林子彤 (5109)

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Outline

1. Introduction
2. Biochemical characterization of recombinant L-fucose isomerase from *Caldanaerobius polysaccharolyticus* for L-fuculose production
3. Thermophilic L-fucose isomerase from *Thermanaeromonas toyohensis* for L-fucose synthesis from L-fuculose
4. Conclusion

Abstract

L-fucose and L-fuculose are both rare sugars with excellent potential applications in the fields of medicine and agriculture. Preparation methods include chemical, physical, and enzymatic approaches, with enzymatic methods being safer, gentler, less susceptible to contamination, and free from byproducts. Therefore, the purpose of this study is to explore the preparation of L-fucose or L-fuculose using L-fucose isomerases from different sources and analyze their characteristics. Results indicate that the recombinant L-fucose isomerase, Capo-Lflase, from *Caldanaerobius polysaccharolyticus*, exhibits optimal activity at 55°C and pH 6.5, showcasing high thermal stability with a melting temperature (T_m) of 80.3°C. The presence of Mn^{2+} and Co^{2+} enhances Capo-Lflase's catalytic activity. Ca^{2+} , Fe^{2+} , Ni^{2+} , Mg^{2+} , Cu^{2+} , Ba^{2+} , and Zn^{2+} decreased the activity of Capo-Lflase. Capo-Lflase demonstrates higher substrate specificity for L-fucose, with K_m , k_{cat} and catalytic efficiency (k_{cat} / K_m) values of 94.2 mM, 23854 min^{-1} , and 253.3 $min^{-1} mM^{-1}$, respectively. The conversion rate of 80 g L^{-1} L-fucose to L-fuculose is 28.2%, showing significant potential for industrial applications. On the other hand, the recombinant L-fucose isomerase, *TiFucl*, from *Thermanaeromonas toyohensis*, exhibits optimal activity at 70°C and alkaline pH. The addition of Mn^{2+} and Mg^{2+} enhances its activity, with Mn^{2+} further improving *TiFucl*'s thermal stability and catalytic activity. *TiFucl* demonstrates a specific activity of 199.8 U/mg at 70°C, with K_m (Michaelis constant) and k_{cat} (turnover number of substrate) values of 33.4 mM and 901.7 s^{-1} , respectively. It displays better substrate specificity for L-fuculose, suggesting its potential application in the industrial production of L-fucose.

Reference

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