Characterization of D-lyxose isomerase from different sources

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Outline

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Abstract

D-lyxose isomerase is an aldose-ketose isomerase with broad substrate specificity that can catalyze isomerization reaction between enzymes, and has been used for the production of functional rare sugars D-mannose and L-ribose. At present, broad application of D-mannose has been used in the field of food, cosmetic and pharmaceutical industries. The preparation of D-mannose derived from the chemical synthesis, plant extraction and enzymatic method, with the enzymatic approach being suited for industrial production. Therefore, this study aims to investigate characterization analysis of D-lyxose isomerase from different sources. A novel D-lyxose isomerase (D-LIase) from *Thermoprotei archaeon* through genetic transformation and purification by using a nickel ion-affinity column has been used for analysis of optimal conditions and substrate specificity. The results showed that the optimal conditions for D-LIase were at pH 6.5 and temperature 80 to 85°C, in the presence of 0.5 mM Ni^{2+}. Furthermore, the conversion rate still reached approximately 20% when the reaction happened at 80 °C. This demonstrates the potential of D-LIase exhibits excellent substrate specificity at high temperatures. On the other hand, D-lyxose isomerase from *Bacillus velezensis* (BvLI) exhibited maximum activity at 55°C and pH 6.5. The addition of Co^{2+} and Mn^{2+} effectively enhanced BvLI activity, while Cu^{2+} and Zn^{2+} completely inhibited its activity. The optimal conditions for producing D-mannose were achieved by adding 500 g/L of D-fructose and 25 U/mL of the recombinant BvLI. According to these papers, both of the recombinant D-lyxose isomerases indicated highly thermal stability and suitable for survival in weakly acidic condition. In summary, D-lyxose isomerase have great potential for large-scale application in the production of rare sugars in the future.

Reference

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