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Greening the Blue: Enzymatic Degradation of Commercially Important Biopolymer Dextran Using Dextranase from Bacillus Licheniformis KIBGE-IB25

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Abstract : Commercially important biopolymer, dextran, is enzymatically degraded into lower molecular weight fractions of vast industrial potential. Various organisms are associated with dextranase production, among which fungal, yeast and bacterial origins are used for commercial production. Dextranases are used to remove contaminating dextran in sugar processing industry and also used in oral care products for efficient removal of dental plaque. Among the hydrolytic products of dextran, isomaltooligosaccharides have prebiotic effect in humans and reduces the cariogenic effect of sucrose in oral cavity. Dextran derivatives produced by hydrolysis of high molecular polymer are also conjugated with other chemical and metallic compounds for usage in pharmaceutical, fine chemical industry, cosmetics, and food industry. Owing to the vast application of dextran and dextranases, current study focused on purification and analysis of kinetic parameters of dextranase from a newly isolated strain of Bacillus licheniformis KIBGE-IB25. Dextranase was purified up to 35.75 folds with specific activity of 1405 U/mg and molecular weight of 158 kDa. Analysis of kinetic parameters revealed that dextranase performs optimum cleavage of low molecular weight dextran (5000 Da, 0.5%) at 35ºC in 15 min at pH 4.5 with a Km and Vmax of 0.3738 mg/ml and 182.0 µmol/min, respectively. Thermal stability profiling of dextranase showed that it retained 80% activity up to 6 hours at 30-35ºC and remains 90% active at pH 4.5. In short, the dextranase reported here performs rapid cleavage of substrate at mild operational conditions which makes it an ideal candidate for dextran removal in sugar processing industry and for commercial production of low molecular weight oligosaccharides.

Keywords : Bacillus licheniformis, dextranase, gel permeation chromatograpy, enzyme purification, enzyme kinetics
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