

Xylitol Production Using Yeast and Fungi

Tohru Suzuki

Life Science Research Center, Gifu University, Japan

Xylitol is one of important non-sugar sweetener, which prevents dental caries. It is also used as insulin-independent carbohydrate for diabetic patients. Commercially, xylitol is mainly produced from wood cell-wall by chemical process, but some trial using biological process also tried.

The cell wall of plants is a composite material consisting of cellulose, hemicelluloses, and lignin. Xylan, a major component of hemicellulose, is one of the most abundant biopolymers after cellulose. Xylan consists of a β -1,4-linked xylopyranosyl main chain, and some side chains with various residues: L-arabinofranose, D-glucuronic acid, *p*-cumaric acid, and *O*-acetyl. Xylan is degraded by several bacterial or fungal hydrolyzing enzymes: xylanase (EC 3.2.1.8), which produces xylo-oligosaccharides; β -xylosidase (EC 3.2.1.37), which produces xylose (X1); and some side-chain degrading enzymes such as arabinofuranosidase. In the yeast and fungi, it is thought that produced xylose will converted to xylitol by NADPH-dependent xylose reductase, and re-reduced by by NAD-dependent xylitol dehydrogenase. We think it will be possible to establish high cost-performance bioprocess, using metabolic engineering.

Here, I will present our recent study of microbial process for xylitol production.

- (I) Cloning and characterization of bacterial xylanase
- (II) Cloning of xylose reductase and xylitol dehydrogenase
- (III) Metabolic engineering of *Aspergillus oryzae*
- (IV) Optimization of xylitol production using bioreactor