Consolidated bioprocessing of hemicellulose enriched lignocellulose to succinic acid through a microbial co-cultivation system

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Abstract

Consolidated bioprocessing (CBP) has been widely adopted as a cost-effective strategy for the bioconversion of lignocellulosic biomass into bio-chemicals. Microbial consortium can complete the complex CBP processes through the cooperation of different microorganisms. In this study, a synthetic microbial consortium was designed, which is composed of a hemicellulase-producing bacterium Thermoanaerobacterium thermosaccharolyticum and succinic acid production specialist Actinobacillus succinogenes 130Z. The simultaneous conversion of xylose hydrolyzed by T. thermosaccharolyticum could maintain a high hydrolyzing rate, which would facilitate succinic acid production by A. succinogenes 130Z. After process optimization, 32.50 g/L of succinic acid with yield of 0.41 g/g was obtained from 80 g/L xylan through CBP, representing the highest succinic acid production directly from hemicellulose materials. In addition, 12.51 g/L of succinic acid was directly produced from 80 g/L of corn cob. The above results demonstrated that this CBP based microbial co-cultivation system had great potential to convert lignocellulosic biomass into various bio-chemicals.

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