An update of 'one-pot SSF': optimization of enzyme cocktails and comparison of different fermenting microbes

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Abstract

We have developed a novel fermentation strategy, named 'one-pot SSF', which integrated pretreatment, saccharification, and fermentation in one pot, for bioethanol production from sugarcane bagasse. In addition, we have found that different pretreated sugarcane bagasse favored different enzyme cocktails for efficient saccharification. In this work, we attempted to combine the advantages of these two works and to upgrade the current 'one-pot SSF'. Different proportions of xylanase were blended with Celluclast 1.5 with fixed amount β-glucosidase (Novozym 188) supplementation. The resultant enzyme cocktails were employed to hydrolyze the pretreated SCB without detoxification procedure. Results showed that cellulases alone gave rise to the lowest monosaccharides yield, whereas xylanase alone resulted in higher monosaccharides formation in both cases with enzyme loadings of 15 and 30 FPU/g solid. The optimal cellulase proportion was found to be 20-40% depending on the enzyme loading. One-pot SSF with or without presaccharification were studied using different fermenting organisms with the aim to investigate the possibility of one-pot SScF.

S. cerevisiae CICC 1445, which is unable to convert xylose to ethanol, gave rise to 15.2 g/L ethanol, corresponding to 77.39% of the theoretical value. Candida shehatae CICC1766 and the Pichia stipitis CICC 1960, which are able to convert xylose into ethanol, resulted in 16.2 and 11.8 g/L ethanol, respectively. Ethanol yield obtained by C.shehatae fermentation was increased by 28.21% compared with the original one-pot SSF. It should be noted that xylose was indeed assimilated but did not convert into ethanol completely. The ability of converting xylose into ethanol was inhibited in this fermentation strategy. Further studies are required to figure out the reason for further engineering such microbes.

Biography

Jingbo Li has completed his PhD at the age of 32 years from Aarhus University, Denmark. He is the postdoc fellow at Massachusetts Institute of Technology, USA. He has over 30 publications that have been cited over 200 times, and his publication H-index is 9and has been serving as an editorial board member of several Journals.

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