

Xylose Utilization Stimulates Mitochondrial Production of Isobutanol and 2-methyl-1-butanol in *Saccharomyces cerevisiae*

Background/objective

Branched-chain higher alcohols (BCHAs; e.g. isobutanol, 2-methyl-1-butanol (MbOH)) are promising advanced biofuels due to their increased energy density and better compatibility with existing gasoline infrastructure as compared to ethanol. To fully valorize lignocellulosic biomass, there is also a need to engineer yeasts to utilize xylose, an abundant byproduct of hemicellulose hydrolysis. Here, researchers address both of these challenges by engineering *Saccharomyces cerevisiae* for improved BHCA yield from xylose.

Approach

- ❖ Introduced mitochondrial isobutanol biosynthetic pathway in the xylose-consuming *S. cerevisiae* strain H145E10-XYLA3-1.
- ❖ Deleted *PHO13*, *ALD6*, and *BAT1* to enhance xylose assimilation and isobutanol production, and added additional copies of the mitochondrial isobutanol pathway.

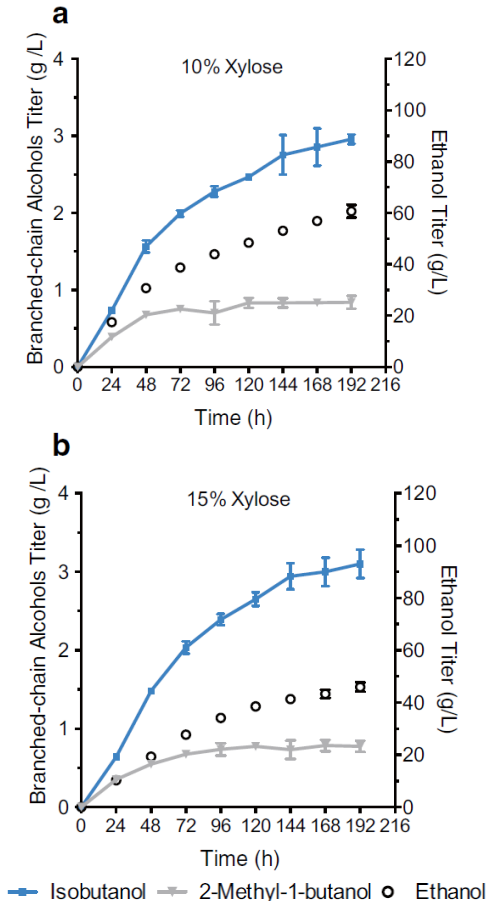
Results

- ❖ The engineered strain produced up to 4g/L BCHAs as 3.1 g/L isobutanol and 0.91 g/L 2-methyl-1-butanol, a 28 and 9.5-fold increase, respectively, over previously reported maximum yields.
- ❖ This is the first report of MbOH production from xylose.

Significance

This research demonstrates production of BCHAs from xylose and provides a foundation for further breakthroughs in the production of advanced biofuels from abundant lignocellulosic byproducts.

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Isobutanol, 2-methyl-1-butanol, and ethanol production on 10% (a) and 15% (b) xylose