BRC Science Highlight
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High-Level β-Carotene Production from Xylose by Engineered *Saccharomyces cerevisiae* Without Overexpression of a Truncated *HMG1* (t*HMG1*)

Background/objective

Xylose is the second-most abundant and an inedible sugar component of lignocellulose biomass. When the cellulosic biomass-based bioeconomy is implemented, xylose will be produced at large scales, and consideration will need to be made for this waste stream. β-carotene is a natural pigment and health-promoting metabolite that is used in the nutraceutical, feed, and cosmetic industries. Here, researchers engineered a GRAS yeast *Saccharomyces cerevisiae* to produce β-carotene from xylose.

Approach

- Engineered *S. cerevisiae* to produce β-carotene from xylose using a biosynthetic pathway containing *crtYB*, *crtI* and *crtE* from *Xanthophyllomyces dendrorhous.*
- Examined the engineered strain through comparative fermentation profiling, metabolites analysis, and transcriptional studies.

Results

- The resulting strain produced β-carotene from xylose at a titer three-fold higher than from glucose.
- The advantages of using xylose as a carbon source instead of glucose for β-carotene production were found to be a more respiratory feature of xylose consumption, a larger cytosolic acetyl-CoA pool, and up-regulated expression levels of related genes — including *ACS1* and *HMG1.*
- 772.8 mg/L of β-carotene was obtained in a fed-batch bioreactor culture with xylose feeding.

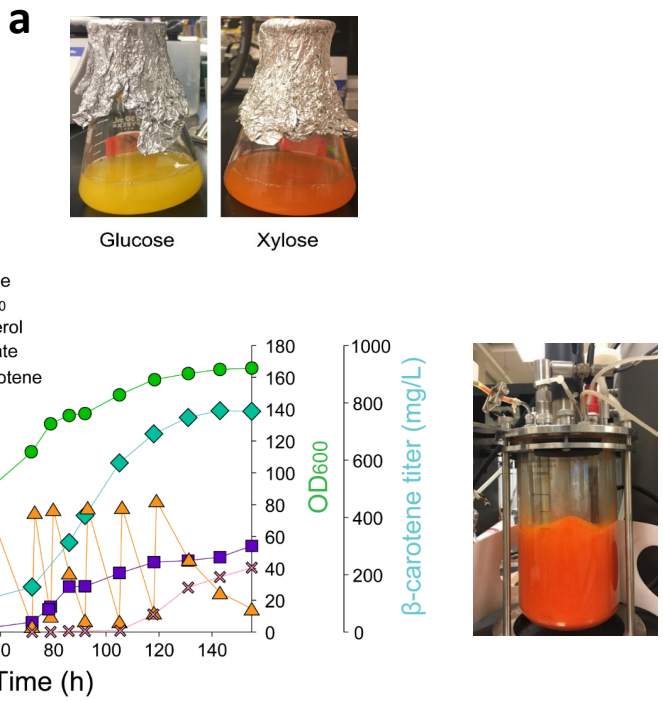

Figure a: Glucose and xylose cultures of the engineered strain SR8B; Figure b: Xylose-fed batch fermentation of the engineered strain SR8B.

Significance

This work demonstrates that xylose utilization is a promising strategy for overproduction of carotenoids and other isoprenoids by engineered *S. cerevisiae* in a cellulosic biomass-based bioeconomy.

*Sun, et al. 2020. "High-level β-carotene Production from Xylose by Engineered Saccharomyces cerevisiae Without Overexpression of a Truncated HMG1 (tHMG1)." **Biotechnology and Bioengineering**. DOI:10.1002/bit.27508.*

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