

Rewiring Yeast Metabolism for Producing 2,3-Butanediol and Two Downstream Applications: Techno-Economic Analysis and Life Cycle Assessment of Methyl Ethyl Ketone (MEK) and Agricultural Biostimulant Production

Background/Objective

- 2,3-butanediol (2,3-BDO) is a multi-functional chemical with numerous industrial applications, including as a precursor to methyl ethyl ketone (MEK), and has various benefits for plants.
- MEK can be used as an efficient fuel additive to produce high-quality aviation fuels.

Approach

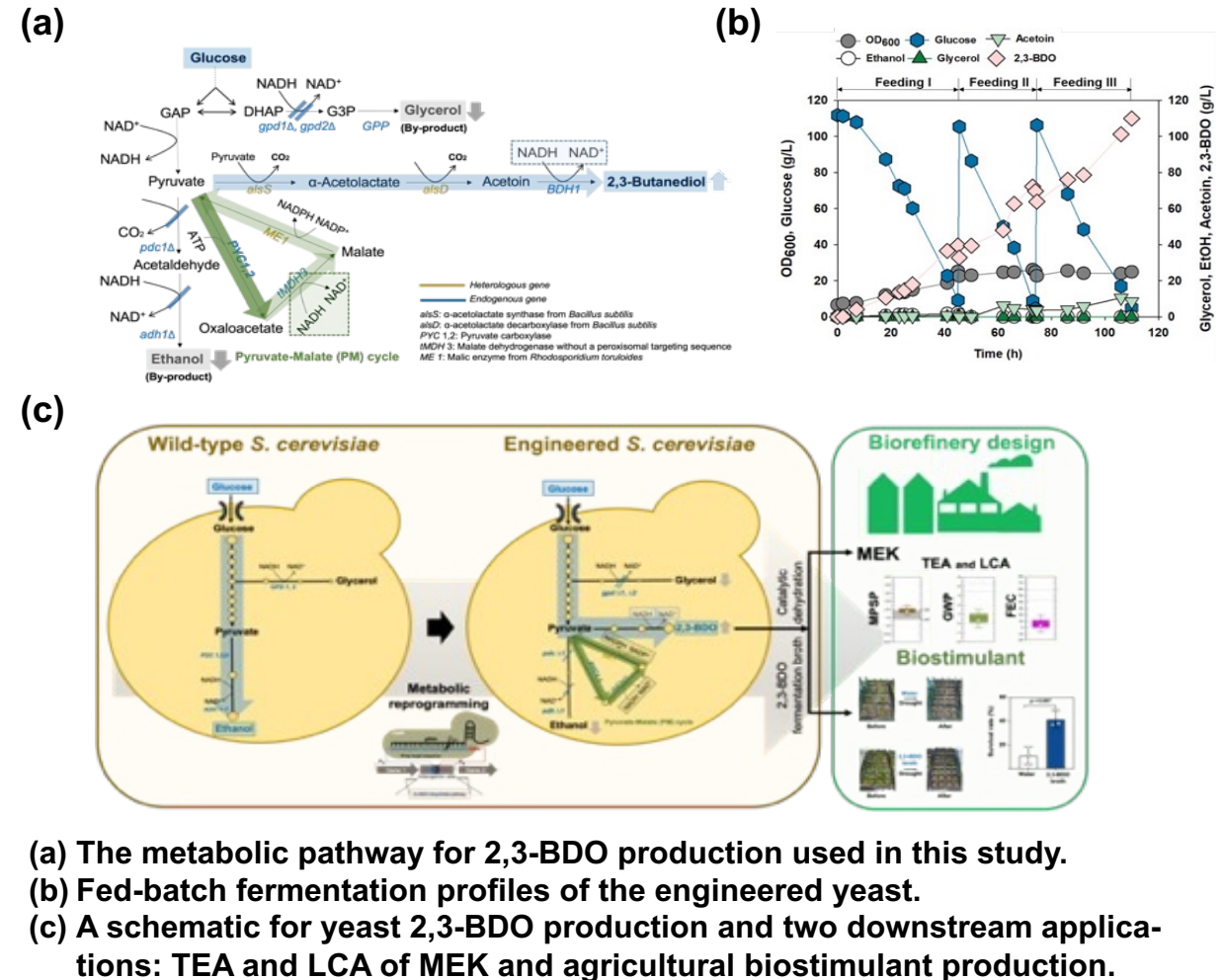
- Engineered *S. cerevisiae* to produce 2,3-BDO efficiently.
- Conducted TEA and LCA of the production of MEK through catalytic dehydration of 2,3-BDO.
- Explored the possibility of using yeast 2,3-BDO fermentation broth as a biostimulant inducing drought tolerance in plants.

Results

- Produced 109.9 g/L of with a productivity of 1.0 g/L/h without ethanol and glycerol.
- TEA and LCA demonstrated that bio-based MEK production can be economical and sustainable.
- Yeast 2,3-BDO fermentation broth can induce drought tolerance in *Arabidopsis* plants.

Significance/Impacts

This is the first paper to present and evaluate these two valuable downstream applications of yeast 2,3-BDO fermentation broth.



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