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Increasing extracellular cellulase activity of the recombinant *Saccharomyces cerevisiae* by engineering cell wall-related proteins for improved consolidated processing of carbon neutral lignocellulosic biomass

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Highlights

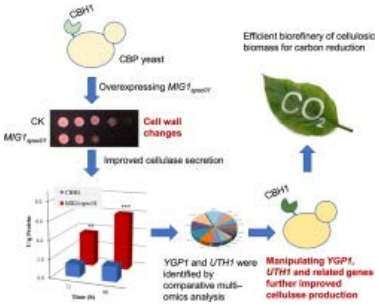
- â€¢The CBP yeast strains were engineered to benefit conversion of cellulosic biomass.
- â€¢Overexpression of $MIG1_{spsc01}$ affected expression of proteins related to cell wall.
- â€¢Engineering $MIG1_{spsc01}$, *UTH1* and *YPG1* are novel strategies for improving CBP.
- â€¢Disruption of *YGP1* with overexpressing *SED5* elevated CBH activity of 2.2-fold.
- â€¢CBP yeast with improved cellulase production facilitates economic bioproduction.

Abstract

Sustainable bioproduction usingÂ carbon neutral feedstocks, especially lignocellulosic biomass, has attracted increasing attention due to concern over climate change and carbon

reduction. Consolidated bioprocessing (CBP) of lignocellulosic biomass using recombinantÂ yeast of *Saccharomyces cerevisiaeÂ* is a promising strategy forÂ lignocellulosic biorefinery. However, the economic viability is restricted by low enzyme secretion levels.Â For more efficient CBP, *MIG1Â* $_{spsc01Â}$ isolated from the industrial yeast which encodes the glucose repression regulator derivative was overexpressed. Increased extracellular cellobiohydrolase (CBH) activity was observed with unexpectedly decreased cell wall integrity. Further studies revealed that disruption ofÂ *CWP2*, *YGP1*, andÂ *UTH1*,*Â* which are functionally related toÂ *MIG1Â* $_{spsc01}$, also enhanced CBH secretion. Subsequently, improved cellulase production was achieved by simultaneous disruption ofÂ *YGP1Â* and overexpression ofÂ *SED5*, which remarkably increased extracellular CBH activity of 2.2-fold over the control strain. These results provide a novel strategy to improve the CBP yeast for bioconversion of carbon neutral biomass.

Graphical abstract



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Keywords

Cellulase production; *MIG1*$_{spsc01}$; *UTH1*; *Saccharomyces cerevisiae*; Consolidated bioprocessing (CBP)

Data availability

Data will be made available on request.

Cited by (0)

1 These authors contribute equally to this work.

View Abstract