O.235. Multi-feedstock approach for ethanol production using cell surface engineered *Saccharomyces cerevisiae*

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The economic viability of second generation bioethanol has been pursued for several years, with struggles such as the high cost of enzymes and low ethanol titers receiving great attention. *Saccharomyces cerevisiae* is the preferred microorganism for bioethanol production and has been extensively studied and genetically modified for optimization of lignocellulosic processes. Moreover, *S. cerevisiae* strains isolated from industrial environments have shown increased robustness and fermentative capacities in lignocellulose-to-ethanol processes. In this work, we tested different industrial strains as hosts to construct a *S. cerevisiae* strain with cell-surface display of cellulases to reduce the enzyme load of costly commercial enzymes. Another approach to improve the profitability of 2nd generation bioethanol processes has been the supplementation of lignocellulosic fermentation media with cheese whey. Considering this, cheese whey -a by-product of the dairy industry rich in lactose and nitrogen sources- was added to the process to avoid commercial supplementation of nutrients, and as an additional carbon source to improve the final ethanol titer. For that, the cellulase-displaying *S. cerevisiae* was further modified to display β-galactosidase to consume the lactose present on cheese whey. Using *S. cerevisiae* CAT-1 as background, a robust lactose-consuming cellulolytic strain was constructed, which allowed the production of high ethanol titers (47 g/L) from a mixture of hydrothermally pretreated corn cob and cheese whey, using low quantities of commercial cellulases (5 FPU/g corn cob). An economical analysis showed that this developed strain resulted in a 2.5-fold increase in annual ethanol production and in a 60% reduction in material costs in comparison with the non-engineered CAT-1. This multi-feedstock approach results on the valorization of both lignocellulosic biomass and agro-industrial residues, allowing to simultaneously increase carbon source and decrease costs with nutritional supplementation and ultimately attain a more efficient ethanol production.

Funding: This study was supported by the Portuguese Foundation for Science and Technology (FCT, Portugal) under the scope of the strategic funding of UIDB/04469/2020, the MIT-Portugal Program (Ph.D. Grant PD/BD/128247/2016 to JTC), and Biomass and Bioenergy Research Infrastructure (BBRI)- LISBOA-01-0145-FEDER-022059 funded by the European Regional Development Fund (ERDF) under the scope of Norte2020 - Programa Operacional Regional do Norte.