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ETHANOLIC FERMENTATION BY KLUYVEROMYCES MARXIANUS WITH IMIDAZOLIUM IONIC LIQUIDS

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Ctatement of the Problem: Lignocellulosic Biomass (LCB) is an Jabundant and renewable feedstock of great interest for the production of high value chemicals and biofuels, such as second generation bioethanol. It consists of three major components: cellulose, hemicellulose, and lignin. However, the access to these biopolymers is hindered by the recalcitrance of the plant cell walls. For that reason, a pretreatment step is necessary to disorganize and/or fractionate the lignocellulosic matrice. Recently, the use of Ionic Liquids (ILs) in the LCB pretreatment has shown his effectiveness in improving ethanolic yields after enzymatic saccharification and microbial fermentation [1,2,3]. However residual IL remaining in the pretreated LCB, even after several washing steps, had significant inhibitory effects on the fermentative microorganisms, but interaction mechanisms between ILs and cells are still unknown [4]. In this context, the purpose of this study was to investigate the impact of two room temperature imidazolium-ILs on Kluyveromyces marxianus, a thermotolerant ethanologenic yeast [5]. Methodology: K. marxianus was grown on a culture medium containing glucose as carbon source with various concentrations of the classically used IL: 1-ethyl-3-methylimidazolium acetate [Emim][OAc], or the newly developped IL: 1-ethyl-3-methylimidazolium methylphosphonate [Emim][MeO(H)PO2]. The effects of both ILs were assessed on K. marxianus growth, glucose consumption and ethanol production. In addition, the respirofermentative status and cell morphology were also characterized. Findings: The presence of ILs in the culture medium induced wrinkled, softened and holed yeast shapes. K. marxianus tolerated IL additions until 2% for [Emim] [OAc] and 6% for [Emim][MeO(H)PO2]. Below these thresholds, some precise IL concentrations enhanced ethanolic yields until

+34% by switching the metabolic status from respiratory to fermentative. Conclusion & Significance: these two imidazolium-ILs were appropriate solvents for the LCB pretreatment. K. marxianus is an interesting fermentative yeast in a second generation bioethanol process with IL pretreatment.



Biography

Ranim Alayoubi is a second-year PhD student at both the University of Picardie Jules Verne in Amiens, France, and the Lebanese University. She received a bachelor's degree in biochemistry and a master's degree in applied biotechnology from the Lebanese University. Her current field placement is at the Enzymatic and Cellular Engineering Unit FRE-CNRS 3580 in Amiens, France. Her research interests include the valorization of the lignocellulosic biomass in second generation bioethanol and high value chemicals, in mild and eco-friendly conditions. Ranim Alayoybi thanks the Conseil Régional de Picardie/Hauts de France, the European Fund of Regional Development (SI-SAF project), the AZM & Saade association and the Lebanon University for funding this work.

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