Lipase-catalyzed Synthesis of Glucose and Fructose Esters in Continuous Flow Conditions

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The esters synthesis by enzymatic catalysis in non-aqueous media allows obtaining pure products, minimizing side reactions compared to chemical processes1. In this work, was carried out the acylation of glucose and fructose ketal by a residue composed of free fatty acids obtained from the refine of crude palm oil (RePO) catalyzed by the commercial immobilized lipase from *Rhizomucur miehei* (RM IM). Palm oil has a wide range of food (cooking oil) and non-food applications, and palmitic acid, oleic acid and stearic acid were the most abundant fatty acids in RePO2. The esterification reactions were investigated in continuous flow conditions using stock solutions (ketal:RePO) 1:1 in tBME to each sugar in several concentrations. The low sugar solubility in organic solvents was resolved through the ketal synthesis. The starting mixture was stirred for 5 minutes while the instrument (Asia Flow Reactor) was equipped with Omnifit column (2.4 ml) containing the immobilized lipase RM IM. The reaction parameters (room temperature; 0.1-1.0 ml/min flow rate) were selected on the flow reactor, and processing was started, whereby only pure solvent (tBME) was pumped through the system until the instrument had achieved the desired reaction parameters and stable processing was assured. After processing through the flow reactor, the conversion in each flow rate was measures by quantifying residual fatty acid by a modification of the Lowry and Tinsley method3. The best result for glucose ketal reactions was observed in 40 mM, in 0.1 ml/min flow rate, with 98.85% (± 0.44) conversion in 20 min of residence time. For fructose ketal reactions, the best result was observed in 500 mM, in 0.1 ml/min flow rate, with 99.76% (± 0.24) conversion in 20 min of residence time. Thus, we developed a simple and fast method of enzymatic esterification which can provide products with high added value.

1Yan Y., Bornscheuer U.T., Cao L., Shimid R.D.C., *Enzyme Microb. Technol..* **1999**, 25, 725.

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3Lowry R.R., Tinsley I.J., *J. Am. Oil Chem. Soc.* **1976,** 53,*470.*