Enzymatic synthesis of 6-O-glucosyl-poly(3-hydroxyalkanoate) in organic solvents and their binary mixture

A.M. Gumel a, M.S.M. Annuar a, *, T. Heidelberg b

a Institute of Biological Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia
b Department of Chemistry, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia

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ABSTRACT

The effects of organic solvents and their binary mixture in the glucose functionalization of bacterial poly-3-hydroxyalkanoates catalyzed by Lecitase™ Ultra were studied. Equal volume binary mixture of DMSO and chloroform with moderate polarity was more effective for the enzyme catalyzed synthesis of the carbohydrate polymer at ≈38.2 (%±0.8) reactant conversion as compared to the mono-phasic and other binary solvents studied. The apparent reaction rate constant as a function of medium water activity (aw) was observed to increase with increasing solvent polarity, with optimum aw of 0.2, 0.4 and 0.7 (%±0.1) observed in hydrophilic DMSO, binary mixture DMSO:isoctane and hydrophobic isoctane, respectively. Molecular sieve loading between 13 to 15 g L−1 (%±0.2) and reaction temperature between 40 to 50 °C were found optimal. Functionalized PHA polymer showed potential characteristics and biodegradability.

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