REGATA

REDE GALEGA DE TECNOLOXÍAS AMBIENTAIS

Research Stays 2018

Enzymatic oligomerization of rutin in biocompatible aqueous biphasic systems

July 1st, 2018 | July 31st, 2018 + September 1st, 2018 | October 15th, 2018

Objectives

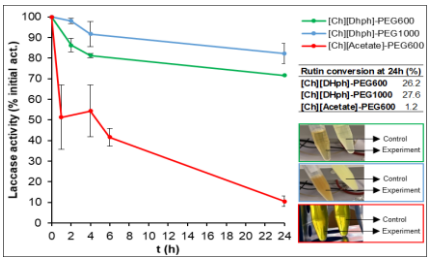
The main objective of this research stay was to develop biocompatible and thermoreversible aqueous biphasic systems that would allow the enzymatic oligomerization of rutin and the further separation of the obtained products from the enzyme, thus opening the possibility of re-using the biocatalyst.

Methodology

The solubility and partitioning of rutin oligomers and laccase was studied in biocompatible ABS composed of polyethylene glycol (PEG) and different choline based ionic liquids. Subsequently, phase diagrams at different temperatures (25 and 40ºC) were obtained for those ABS who successfully separated the products from the biocatalyst. Afterwards, rutin oligomerization was studied in three different ABS that showed both proper opposite partitioning and thermoreversibility, monitoring enzymatic activity and rutin conversion for 24 hours of reaction.

Results

[Ch][Glycolate], [Ch][Glutarate] and betaine, when mixed with PEG 600, concentrated both enzyme and oligorutin in the same phase, thus not leading to systems with the desired properties. [Ch][Dihydrogenphosphate] mixed with PEG of different molecular weight (400, 600 and 1000 g/mol) lead to systems were rutin oligomers and laccase were mainly concentrated in different phases, achieving better separations with higher molecular mass PEGs. The ABS formed by [Ch][Acetate] and PEG 600 gave the best partitioning of oligorutin and laccase observed in this stay. Rutin oligomerization by laccase was then studied in the systems [Ch][Dhph]-PEG 600/1000 and [Ch][Acetate]-PEG 600.



Rutin oligomerization was not achieved in the ABS using [Ch][Acetate] as ionic liquid, because de pH of the system was not adequate for laccase (pH~8.8).

Although rutin oligomerization was achieved in [Ch][DHph]-PEG systems, rutin conversion to oligomers was not as high as observed in previous work.

Highlights

The enzymatic oligomerization of the flavonoid rutin was performed using aqueous biphasic systems as reaction medium. The good separation of oligorutin and laccase to opposite phases opens the possibility of recycling the enzyme.

Further work will be performed regarding this re-use of laccase and the optimization of the composition of the reaction medium in order to increase.

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