Valorization of Apple Pomace: bacterial cellulose-immobilized β-Glycosidase allows efficient production of phloretin

Luca Nespoli, Agostina Colacicco, Emma Ribul Moro, Francesco Molinari,

Stefano Farris, Martina Letizia Contente, and Diego Romano

Department of Food, Environmental And Nutritional Sciences, Università degli Studi di Milano "La Statale", Via Mangiagalli 25, 20133, Italy
E-mail: luca.nespoli@unimi.it

Abstract: Food industries produce around 4 million metric tons every year of apple pomace [1], a mixture of residues and byproducts from apple processing. A high abundance of valuable phenolic compounds is still present in apple residues, though representing a cheap natural source of bioactive molecules for many industrial applications.

Among these compounds, phloretin (PHL) is drawing particular attention for its biological properties. However, due to its small amount present in the biomass with respect to its glycoside, phloridzin (PHZ), the latter is used as starting material of choice [2]. Our group used apple waste to grow *Komagataeibacter xylinus* DSM2325, an acetic acid bacteria, able to produce high quantity of bacterial cellulose (BC).

By simple chemical modifications [3], we turned it into a promising support for enzymatic immobilization of extremophilic β-glycosidase AheGH174. Using imm-AHeGH1 in a biphasic systems (HEPES buffer:TMO 50:50, 20 mg/mL imm-AHeGH1, 2 mg/gmatrix enzyme loading, 5 g/L phloridzin) complete de-glycosylation is observed after 7 h of reaction.

While the enzyme immobilization onto BC cellulose pellicles allowed for high catalyst stabilization and reuse (>7 cycles), the employment of the unconventional green solvent TMO dramatically facilitated the isolation of the desired product (i.e., 95% of yield), leaving the sugar moieties in the water phase for their potential reutilization.

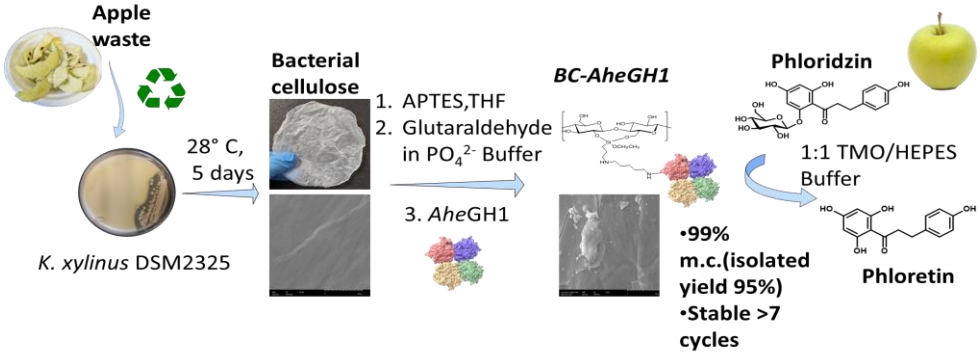

Figure 1: Schematic representation for the biocatalytical production of phloretin.

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