IMMOBILIZATION AND STABILIZATION OF THE ENDO-1,4-BETA-XYLANASE OF MALBRANCHEA PULCHELLA FOR PRODUCTION OF THE XYLOOLIGOSACCHARIDES

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Body

Over the last few years, the lignocellulosic biorefinery concept has been extended beyond the application of biofuel production. Innovative and efficient technologies for lignin, cellulose, and hemicellulose fractionation allow the implementation of integrated processes for the co-production of bioenergy and higher value-added bioproducts. Among the different approaches, the use of Endo-1,4-β-xylanases (EC 3.2.1.8) in the hydrolysis of rich-xylan feedstocks has increased in the integrated process to produce fermentable and xylooligosaccharides (XOS). Nowadays, XOS has been preferentially used as prebiotic components in the development of new functional foods for presenting additional biological benefits such as antioxidant, inflammatory, and immunomodulatory activities. In the current work, we immobilized an endo-1,4-beta-xylanase of *Malbranchea pulchella* (Mpxyn10) and evaluated its potential in the production of XOS from xylan from various sources. Mpxyn10 was immobilized on agarose-activated supports (Glyoxyl-, MANAE-, GLUT- and PEI-agarose) and commercial Purolite support. Values >90% of immobilization yield were obtained on amino-activated supports (Purolite, MANAE, and PEI-agarose) after 120 min, and the highest values of activity recovery were obtained for MANAE-MpXyn10 (137%) and Purolite-MpXyn10 (142%) derivatives. MANAE- and Purolite-MpXyn10 derivatives maintained more than 90% of their activity after 24 h of incubation at 70 °C, while the residual activity of free MpXyn10 was only 11%. MpXyn10 derivatives were also active and stable over a wide range of pH (4.0-6.0) and in the presence of furfural and HMF compounds. MpXyn10 derivatives were tested to produce XOS from xylan from various sources. Maximum values of XOS (xylobiose and xylotriose) were found for xylan beechwood at 8.1 mg mL^{-1}, birchwood at 8.6 mg mL^{-1}, and wheat arabinoxylan at 8.9 mg mL^{-1} after 3 h of reaction, at 50 °C, using Purolite-MpXyn10. This derivative was reused in various reaction cycles, maintaining more than 80% of yield XOS after 6 cycles of reaction. The results obtained in this work provide a basis for the development of applications of immobilized MpXyn10 to XOS production and other high value-added product in the lignocellulosic biorefinery field.

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Palavras-chave : Immobilization; Xylanase; fungi; xylooligosacharides; XOS