

Xylooligosaccharides from potential agricultural waste: Characterization and screening on the enzymatic hydrolysis factors

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ABSTRACT

The interest of lignocellulosic biomass to be utilized in bioconversion sectors has gaining much attention recently. As corresponding to this, an experimental study was done to investigate the potential agricultural waste for xylan preparation and to screen the factors affecting xylooligosaccharides (XOS) production. Characterization of oil palm frond bagasse (OPFB), oil palm empty fruit bunch (OPEFB), and rice straw (RS) before and after pretreatment was performed in terms of chemical and physical properties. Enzymatic hydrolysis using a 2^{5-1} fractional factorial design was further conducted to evaluate the effect of solid loading, enzyme loading, temperature, hydrolysis time and agitation on XOS production from the selected agricultural waste. From characterization results OPFB was determined as the greatest promising agricultural waste for XOS production. Pretreatment on OPFB simultaneously exhibited the highest increase of xylan recovery and lignin removal. XOS production up to 174.74 mg/g through enzymatic hydrolysis was successfully achieved from the pretreated OPFB. The enzymatic hydrolysis conditions of 1% solid loading and 50 U/mL enzyme loading at 55 °C temperature for 4 h hydrolysis time with 50 rpm of agitation were found efficient to obtain maximum XOS production. Among those factors solid loading was determined as the most significant factor that contributed to the increase of XOS production. The findings from this study have verified that acid pretreatment could improve the biomass structure by disrupting its structure which is important to facilitate enzymatic hydrolysis for high yield of XOS production.

KEYWORDS:

Xylooligosaccharides; Oil palm frond bagasse; Acid pretreatment; Xylan recovery; Enzymatic hydrolysis