

INFLUENCE OF PRETREATMENT ON THE PRODUCTION OF HIGHLY PURIFIED XYLOOLIGOSACCHARIDES FROM WHEAT CHAFF

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ABSTRACT

Xylooligosaccharides (XOS) are oligomeric sugars with different health benefits. It was demonstrated that XOS are resistant to gastric digestion and reduce the risk of cancer. Some of the unique properties of XOS include high stability in different pH and temperature ranges. All of that makes xylooligomers an ideal food ingredient. However, lignocellulosic biomass is a carbohydrate-lignin complex, and the production of XOS from such material is not that simple. XOS production from lignocellulose is carried out in a two-stage combining physical. The aim of this study was to produce XOS from wheat chaff, which represents underutilized agricultural waste material. The influence of different pretreatment procedures followed by hydrolysis of pretreated material by xylanase on XOS production yield and purity was studied. Wheat chaff was subjected to ultrasound, hydrothermal or hydrothermal-alkali pretreatment. Hydrothermal-alkali pretreatment combined with enzymatic hydrolysis produced the highest amount of reducing sugars - 107 and 170 mg/g by xylanase doses, 1.5 and 3U/g, respectively. However, sugar profile analysis by RP-HPLC showed the lowest level of XOS in this case. Hydrothermal pretreatment and subsequent hydrolysis by xylanase produced the highest amount of sugar monomers and resulted in the lowest xylooligosaccharides purity of 66%. The highest achieved purity of hydrolysates was obtained by combining ultrasound treatment with enzymatic hydrolysis. In addition, this procedure resulted in more than six times lower weight loss of xylooligosaccharides in the liquid stream than the other two applied treatments. Results indicated the production of xylooligosaccharides from wheat chaff subjected to ultrasound-xylanase treatment represented an efficient green procedure with the lowest content of impurities in comparison to other studied procedures.

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