ISGC 2019
May 13rd - 17th

N°480 / OC / PC
TOPIC(s) : Polymers / Waste valorization

Potential of wheat bran hemicelluloses as soft multifunctional materials

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PURPOSE OF THE ABSTRACT

Wheat bran is the major by-product of the wheat milling process, which still has limited applications. Hemicelluloses are the most abundant carbohydrates in wheat bran, represented by arabinoxylans (AXs). AXs constitute 20-40% of wheat bran depending on the plant source and tissue [1, 2]. AXs consist of a backbone of 1,4-linked beta-D-Xylp units, substituted by alpha-L-Araf at O-2 and/or O-3 positions. Both the degree and the distribution of substitution varies depending on the plant source and tissue. The L-Araf residues can be further substituted by phenolic acids particularly by ferulic acid. Ferulic acid provides additional functional properties to AXs, thus making them promising sources for the development of soft materials. On the other hand, proteins constitute a big proportion of wheat bran (14-18%) and are of interest to be characterized in terms of their interactions with AXs [2]. Wheat bran proteins can form complexes with carbohydrates through van der Waals forces, ionic and hydrophobic interactions, and/or hydrogen and covalent bonding [3]. Such interactions contribute to the recalcitrance of wheat bran. This influences the extractability of AXs and the characteristics of the materials developed from them.

We have extracted feruloylated arabinoxylans (F-AX) at two different temperatures using a previous technology by subcritical water extraction developed in our group [4]. This method offers environmental advantages compared to traditional hemicellulose extraction methods, since it just used water at high temperature and pressure. The F-AX extracts were used to prepare films and these were characterized in terms of macroscopic properties. In addition, a commercially available AX from wheat endosperm was used as a reference material. In this presentation, the potential of the extracted F-AX to be used as polymeric matrices for multifunctional materials will be discussed, with potential in food packaging and biomedical applications.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

wheat bran | arabinoxylans | multifunctional materials | subcritical water extraction

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