Extraction and chemical characterization of rye arabinoxylan and the effect of β-glucan on the mechanical and barrier properties of cast arabinoxylan films - DTU Orbit (21/12/2018)

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Water-extractable hemicellulose (WEH) fractions, containing approximately 65% arabinoxylans (WE-AX) and 20% mixed-linkage β-glucans were isolated from rye bran. In addition, water-extractable mixed-linkage β-glucans (BG) were isolated from oat bran as a reference material. The β-glucan content of the rye hemicellulose isolate was reduced to less than 5% by a selective lichenase treatment. Rye hemicelluloses, WEH and WE-AX had arabinose-to-xylose ratios of 0.54 and 0.57 and weight-average molecular weights ($M_w$) of 270 000 and 232 000 g/mol respectively. The $M_w$ of BG was higher at 386 000 g/mol. The material properties of films prepared from the rye hemicellulose isolate and WE-AX as such, or with varying amounts of added BG (20:80; 50:50; 80:20 ratios) were studied. Prior removal of β-glucan from the isolate decreased the tensile strength of the films significantly as well as the elongation at break. Addition of BG to the purified WE-AX resulted in an increase in the tensile strength and elongation at break of the films. In contrast, the presence of BG had no clear effect on the oxygen permeability of the films. Both pure rye WE-AX and pure BG films showed excellent oxygen barrier properties (between 0.9 and 1.0 cm$^3$ mm/m$^2$ d kPa). However, the water vapor permeability increased with addition of increasing amounts of BG to WE-AX. To our knowledge, this is the first study on the effect of β-glucans on the material and permeability properties of arabinoxylan-based films. © 2012 Elsevier Ltd. All rights reserved.

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