ENZYMATIC PRODUCTION OF ARABINOXYLO-OLIGOSACCHARIDES WITH PREBIOTIC ACTIVITY FROM PARTIALLY NIXTAMALIZED MAIZE PERICARP

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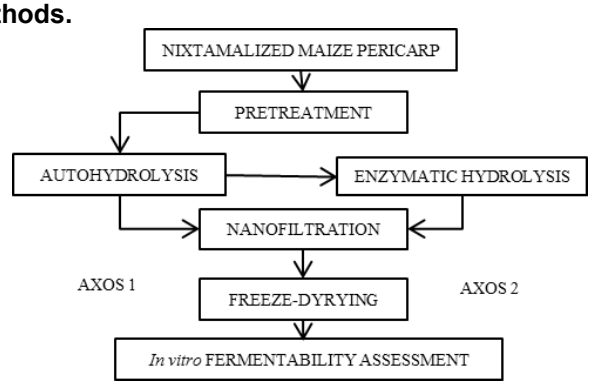
Introduction. Oligosaccharides with prebiotic properties, such as fructo- and galactooligosaccharides, are commercially available, but there is growing interest in developing new prebiotics.[1] A source renewable, abundant and cheap to obtain oligosaccharides are lignocellulosic materials from agro-industrial waste.[2] The oligosaccharide production from lignocellulosic compounds is performed through chemical or biological methods used alternately or sequentially. Chemical methods involve the use of alkalis, acids or high pressures and temperatures (autohydrolysis). The biological methods involve the use of microorganisms and /or their enzymes.[3]

In Mexico, the tortilla industry processed 3.7 million tonnes of maize annually generating significant amounts of by-products, including nixtamlized maize pericarp (NMP). NMP presents a high content of hemicellulose composed by mainly by xylan and arabinose, indicating that can be transformed into arabinoxylo-oligosaccharides (AXOS).

The aim of the study is to obtain AXOS from partially hydrolyzed NMP through an enzymatic process and assess their prebiotic activity.

Methods.



Results. NMP was subjected to a pretreatment to remove starch. The solids after the first treatment were subjected to non-isothermal autohydrolysis to solubilize hemicellulose. In order to reduce the degree of polymerization (DP) of reaction products, autohydrolysis liquors were subjected enzymatic hydrolysis using different commercial preparations single or in combination. The high arabinose content of the solids indicated the presence of high molecular weight branched oligosaccharides. For this reason the enzymatic preparation used should be able to use branched arabinoxylans as substrates. Shearzyme 2x, Pulpzyme HC, Pentopan Mono BG and Veron 191 enzymatic commercial preparations were tested and the treatment that gave greater release of reducing sugars was the combination of two endoxylanases: Shearzyme and Veron 191, enzymes belonging to the GH-10 family capable of attacking the glycosidic linkages closer to the branch points.[4] Solutions containing oligosaccharides were refined by nanofiltration.

Prebiotic potential of freeze-dried solids AXOS1 (high molecular weight) and AXOS2 (enzymatic hydrolyzed) were evaluated *in vitro* though the fermentation of samples by human faecal microbiota. Fermentations were followed by measuring the assimilation of the carbon sources, the production of Short Chain Fatty Acids (SCFA) and lactic acid. Bifidogenic effect was evaluated by *Fluorescent In Situ Hybridization* (FISH). Fermentations show differences in concentration and speed of production of SCFA and lactic acid. AXOS enzymatic treatment obtained which are more rapidly metabolized. In Figure 1, the concentration profiles of SCFA and lactate during AXOS2 fermentation is shown.

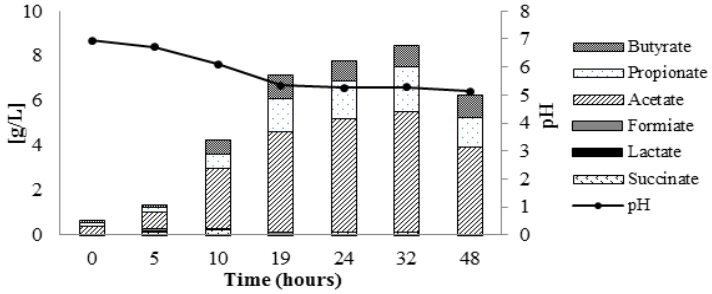


Fig.1 Time courses of the concentrations of SCFA and lactate in fermentation assays carried out with AXOS 2.

Conclusions. Obtaining AXOS through autohydrolysis and enzymatic hydrolysis from NMP is feasible. AXOS obtained after enzyme treatment are metabolized more rapidly than the high molecular weight ones.

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