Evaluation of the effect of soluble polysaccharides of palm kernel cake as a potential prebiotic on the growth of probiotics

ABSTRACT

This paper deliberates the extraction, characterization and examination of potential application of soluble polysaccharides of palm kernel cake (PKC) as a prebiotic. The PKC was defatted and crude polysaccharide was obtained through water, citric acid or NaOH extraction. The physiochemical properties of the extracted polysaccharides viz. total carbohydrates, protein content, solubility rate, monosaccharides composition, structural information and thermal properties were also determined. The extracted soluble polysaccharides were further subjected to a digestibility test using artificial human gastric juice. Finally, their prebiotic potential on two probiotics, namely Lactobacillus plantarum ATCC 8014 and Lb. rhamnosus ATCC 53103 were evaluated in vitro. It was observed that PKC contained ash (5.2%), moisture (7.4%), carbohydrates (65.8%), protein (16.5%) and fat (5.1%). There were significant differences ($P < 0.05$) between the values of NaOH-extracted crude polysaccharides (8.73%) and that of water (3.03%) and citric acid (3.07%)-extracted polysaccharides. The extracted polysaccharides composed of mannose, galactose, glucose, arabinose, xylose and rhamanose, with highest percentage of mannose (62.49%) and galactose (25.42%) in SPCA. Total carbohydrate content in SCPW, SCPCA and SCPN are 57.11%, 56.94% and 50.95%, respectively. The polysaccharides from PKC in this study were found to be highly soluble (> 95%). Protein content in SCPW, SCPCA and SCPN are 0.72, 0.40 and 0.58, respectively, and the peaks which indicated the presence of protein were observed at approximately 1640 cm−1 (amide I). FTIR spectroscopy revealed that the polysaccharides extracts were linked to β and α-glycosidic bonds and thermal analysis using differential scanning calorimeter (DSC) showed the main degradation temperature of SP is about 121 to 125 °C. The SP were found to be highly resistance (> 96%) to hydrolysis when subjected to artificial human gastric juice. The prebiotics potentials of the polysaccharides on probiotics in vitro demonstrated an increase in proliferation of Lb. plantarum ATCC 8014 and Lb. rhamnosus ATCC 53103 with decrease in the pH of the medium and producing organic acids.All the above findings strongly indicated that polysaccharides extracted from PKC, an industrial waste, have a potential to be exploited as novel prebiotics.

Keyword: Prebiotic; Industrial waste; Extraction; Carbohydrates; Probiotic