Valorisation of Alginate Waste Streams from Industrial Extraction as Promising Source of Bioactive Compounds

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Abstract

Brown algae represent an important potential source of functional molecules while, nowadays on an industrial scale, only alginate polysaccharides with gelling properties are obtained. In fact, the extraction of alginate from algae biomass produces a large amount of waste streams and residues with great potential value. In this work, a similar industrially used alginate extraction process was applied to Saccharina latissima and Ascophyllum nodosum. The alginate fractions, waste streams, and residues were characterized as for their proximate composition and by means of Fourier Transform Infrared spectroscopy (FTIR) and High-Performance Anion-Exchange Chromatography with Pulsed Amperometric Detection (HPAEC-PAD), while the functional properties of the various fractions obtained were assessed by means of total phenolic content (TPC) and antioxidant activity (ABTS free radicals scavenging activity, and β-carotene bleaching inhibition assays). Interestingly, the first fraction and the residues exhibited high antioxidant activity and high protein content. Besides, the monosaccharide composition showed a significant amount of fucoidan and glucose polysaccharides in some of the waste streams with reported bioactive functionalities. These results point out the potential for the integral valorization of these bio-residues, which could be applied in a broad range of applications, including as fertilizers, feed ingredients, biostimulant, or even food packaging additives, thus representing an interesting approach to make extraction processes more sustainable giving raise to added-value products.

Keywords: Alginate, antioxidant activity, protein, residues, seaweeds, valorization.