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EXTRACTION AND CHARACTERIZATION OF SULFATED FUCANS FROM BROWN SEAWEED *Fucus vesiculosus*

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Introduction. Sulfated polysaccharides (SP) are complex macromolecules with a wide range of biological properties as anticoagulant, antioxidant, antitumoral, and antiviral, activities. Fucoidan is a SP of great interest for its biological activities (1). Seaweeds are the most important source of non animal SP. Nowadays, large amount of algae remain unused, and considering the importance of the SP that can be found in such organisms, the recovery of these compounds from seaweeds is of relevance. Some studies for SP recovery from natural sources have been carried out using low acid concentrations with long extraction times (1-3 h) (2).
The present work aimed to evaluate the microwave-assisted extraction (MAE) technique using short times and high pressures to recover fucoidan from brown seaweed *Fucus vesiculosus.* Additionally, the extracted fucoidan was characterized.

Methodology. Brown seaweed *Fucus vesiculosus* was collected in North of Portugal. Extraction reactions were performed according to a 2^3 full factorial design with four replicates at the center point, to evaluate the effect of the variables pressure (X_1 = 30, 75, or 120 psi), extraction time (X_2 = 1, 16 or 31 min), and alga/water ratio, AW (X_3 = 1/25, 3/25 or 5/25 g/ml) on the response of fucoidan yield (%). The algae degradation (%), total sugar yield (%), and SO_3 content (%) were also determined to each experimental condition. The experiments were carried out in a microwave digestion oven MDS-2000 (CEM Corporation). Characterization of the recovered fucoidan was performed by HPLC, FTIR, and TGA/DSC analyses.

Results and Discussion. Fucoidan yield was mainly affected by the AW ratio (X_3, p<0.05), which had an effect of negative signal; and by the interaction between pressure and extraction time (X_1X_2, p<0.01) (Fig. 1). When the analysis was performed with estimative of the curvature, a positive influence of the pressure (X_1) at p<0.1 was also verified. The negative effect of the interaction X_1X_2 suggests that the fucoidan yield was increased when the extraction time was decreased. Considering these analyses, it was concluded that MAE extraction under 120 psi, during 1 min, and using an alga/water ratio of 1/25 g/ml was the best condition for the fucoidan recovery.

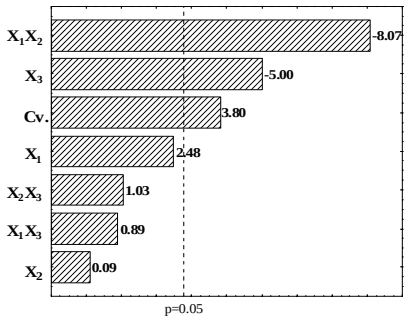

Fig. 1. Pareto chart of standardized effect estimation for fucoidan yield.

HPLC analysis of the precipitated polysaccharide revealed L-fucose as the main constituent and minor proportions of xylose and galactose. The FTIR spectrum (Fig. 2) showed typical absorption bands of fucoidans, at 1240–1255 cm^{-1} and 840 cm^{-1} related with the SO_3 content and the axial C-4 substitution of α-linked L-fucopyranose.

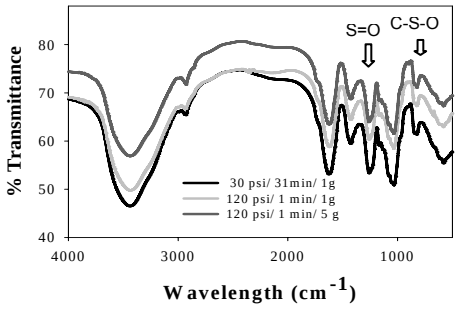

Fig. 2. FTIR of *Fucus vesiculosus* SP under different MAE conditions.

Conclusions. MAE under optimum reaction conditions was an effective method to recover fucoidan from *Fucus vesiculosus*. This method required short extraction times, and non corrosive solvents, resulting in reduced costs and being an environmentally friend technique.

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References.

1. Berteau O, Mulloy B. (2003). *Glycobiology* 13:29R-40R.
2. Rioux L, Turgeon S, Beaulieu M. (2007). *Carbohyd Polym* 69:530-537.