



## Evaluation of autohydrolysis extraction processes on the antioxidant capacity of brown seaweed sulfated polysaccharides

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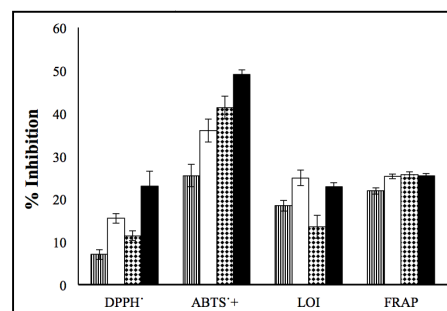
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**Introduction** Brown seaweed fucans are a class of heteropolysaccharides of sulphated fucose with significant economical importance due to their extensive use in biochemical and biotechnology fields. Several studies have demonstrated their properties as free-radical scavengers and antioxidants [1, 2, 3]. Hydrothermal processes have been considered an environmentally friendly and cost-effective technologies that allow biomass fractionation into its main constituents using water in liquid state, as the only reactant, at elevated temperature and pressure [4], in short extraction times, however there are very few reports of the extraction of sulfated polysaccharides bases in these processes. Rodríguez Jasso et al [5, 6] reported the extraction conditions and structural characterization of *Fucus vesiculosus* fucoïdan using two hydrothermal methods (microwave and conventional heating) where the highest yields were obtained using low residence time and extraction temperatures between 170-180 °C.

The previous work has the objective to evaluate the biological activities of the sulfated fucans obtained by microwave (MW) and conventional heating (CH) processes under autohydrolysis conditions by the comparison of different antioxidant methods

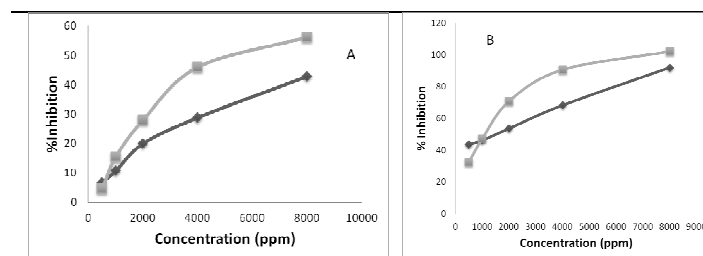
**Methods.** *Fucus vesiculosus* brown seaweed from North Portugal was used in the experiments. The extraction reactions were carried out under a full factorial design varying time, pressure/temperature and alga/water ratio. The conditions used for MW and CH extraction of sulfated fucans isolation, previously established, were an alga/water ratio of 1/25 (w/v), at 172°C for 1 min, and 180 °C for 20 min, for microwave and conventional process, respectively. The antioxidant activity assays evaluated were free radical-scavenging (ABTS and DPPH), lipid oxidation (LOI) and ferric reducing capacity (FRAP) and the inhibition percentage where estimated by different concentrations ranging from 500 – 8000 ppm.

**Results.** The comparison of antioxidant assays ABTS, DPPH, LOI and FRAP at 100 ppm is showed in Fig. 1. The DPPH<sup>•</sup> radical scavenging effects showed that the CH-fucoïdan showed an inhibition value of 22.98 % ± 3.49, which was 50 % higher than the inhibition observed for the MW-fucoïdan. For ABTS<sup>•+</sup> the highest radical values were obtained for the CH-fucoïdan extracts, with an antioxidant capacity of 49.06 ± 1.05. LOI assays showed scavenging effects were over to 22 %, a highest percentage of lipid inhibition in MW-fucoïdan. FRAP assay showed ferric ion reducing activities did not vary among the extraction method with a reducing capacity values higher than 25 %.



**Fig.1** Antioxidant capacity of fucoïdan extracted by microwave (MW) and conventional (CH) autohydrolysis processes: (|||||) MW-500 ppm; (□) MW-1000 ppm; (.....) CH-500 ppm; (■) CH-1000 ppm.

In Figure 2 is observed the increment in the percentage inhibition for ABTS (A) and LOI (B) in relation with the increment of concentration. LOI showed the 100% of inhibition with CH-fucoïdan at 8000 ppm.



**Fig.2** Kinetic %Inhibition of MW and CH fucoïdan (|||||) CH; (■) MW. ABTS (A) and LOI (B)

**Conclusions.** Microwave and conventional autohydrolysis extraction of sulfated polysaccharides exhibited high antioxidant activities with DPPH<sup>•</sup>, ABTS<sup>•+</sup>, LOI and FRAP assays. The highest activity was obtained for CH-fucoïdan with ABTS and LOI.

### References.

- Bhakuni, D. S., Rawat D.S (2005) Bioactive marine natural products, Springer, New York, USA.
- Ruperez,P., Ahrazem,O., Leal, J. (2002). J. Agric. Food Chem. 50 840-845.
- Costa, L. S. et al. 2010. Biomed. Pharmacother. 64, 21-28.
- Ruiz, H. A., Rodríguez-Jasso, R. M., Fernandes, B. D., Vicente, A. A., & Teixeira, J. A. (2013). Renewable and Sustainable Energy Reviews, 21, 35-51.
- Rodríguez-Jasso R.M., Mussatto S.I., Pastrana L., Aguilar C.N. and Teixeira J.A. (2011). Carbohydr. Polym. 86: 1137-1144.
- Rodríguez-Jasso R.M., Mussatto S.I., Pastrana L., Aguilar C.N. and Teixeira J.A.. (2013). J. Appl. Phycol. 25(1): 31-39