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Original article

Azorean macroalgae (*Petalonia binghamiae, Halopteris scoparia* and *Osmundea pinnatifida*) bioprospection: a study of fatty acid profiles and bioactivity

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Summary The Azorean macroalgae *Petalonia binghamiae, Halopteris scoparia* and *Osmundea pinnatifida* are undervalued and require further study regarding their potential use as food. These three seaweed species had low fat contents, and their fatty acid (FA) profiles were characterised by a high proportion of saturated FA (SFA) in the case of *O. pinnatifida* and similar weights of SFA and polyunsaturated FA (PUFA) in the other two species. Within the PUFAs, the ω3 PUFAs were the most prominent in *O. pinnatifida* and *P. binghamiae*, yielding ω3/ω6 ratios that were higher than one. Eicosapentaenoic acid (EPA, 20:5 ω3) was the most important ω3 PUFA (10–14%). Regarding the other bioactive compounds, the polyphenols were found to reach non-negligible levels (140–220 mg/100 g dw). Significant antioxidant activity was detected. Ethanolic extracts of *H. scoparia* and aqueous extracts of *P. binghamiae* showed cyclooxygenase-2 (COX-2) inhibitory capacities between 40% and 79%, indicating anti-inflammatory activity.

Keywords Anti-inflammatory activity, fatty acids, *Halopteris scoparia*, *Osmundea pinnatifida*, *Petalonia binghamiae*.

Introduction

Macroalgae, or seaweed, are a fundamental ocean resource, and mankind has known and used macroalgae for millennia (Dillehay *et al*., 2008; Wells *et al*., 2017). However, macroalgae's utilisation has not been as intensive as that of other marine and terrestrial resources. Some applications have been circumscribed until fairly recently in specific cultural areas, such as Asia, where from time immemorial, seaweed has been used as food (Black, 1953; Wells *et al*., 2017). In fact, in the Chinese Book of Poetry (eighth/seventh century BCE), there is a poem mentioning a housewife who cooks seaweed, and at that time, seaweed was a highly valued food (Black, 1953; Tseng, 1981). Seaweeds are currently used for various purposes, including as food, especially in sushi and other traditional recipes; as biofertiliser; as a source of colloids; or for extracting bioactives with antimicrobial, anticancer, and other biological activities. Approximately 24 million tons of seaweed, mostly cultured (Wells *et al*., 2017), are used every year for these applications (Pereira, 2016). While many different species are known, less than 20 represent 90% of the commercially exploited seaweed biomass.

Accordingly, there are many undervalued and insufficiently characterised seaweed species. The three seaweed species (*Petalonia binghamiae* (J. Agardh) K.L. Vinogradova, *Halopteris scoparia* (Linnaeus) Sauvageau and *Osmundea pinnatifida* (Hudson) Stackhouse) from the Azorean coast (in mid-Atlantic) that were selected for the current study belong to this group (Algaebase 2018). Whereas *P. binghamiae* and *H. scoparia* are brown seaweeds from the orders Ectocarpales (Family Scytosiphonaceae) and Sphacelariales (Stypocaulaceae), respectively, *O. pinnatifida* is a red seaweed belonging to the order Ceramiales and the Family Rhodomelaceae (Algaebase 2018). These species are included in the edible seaweeds group (Pereira, 2016). After being subjected to sun-drying, these seaweeds are currently made into commercial products consumed primarily in Portugal. Given their growing consumption, it would be important to

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