AMINO ACID PROFILE OF TWO SPECIES OF THE GENUS PORPHYRA: AN ALTERNATIVE PROTEIN SOURCE FOR THE HUMAN DIET

Machado, M.[1*], Pimentel, F. B[1]; Machado, S.[1]; Alves, R. C.[1]; Oliveira, M. B. P. P.[1]
[1]REQUIMTE/ LAQV, Faculty of Pharmacy, University of Porto, Rua Jorge Viterbo Ferreira, 228, 4050-313, Porto, Portugal
**marlenemachado753@gmail.com*

Introduction

Food demand is expected to exceed 70% of current food production as the world population grows. As a result, producing more eco-sustainable food and a food chain based on food security is becoming increasingly important [1]. The use of algal biomass as a food source can help to reduce greenhouse gas emissions while also improving land and water use efficiency [2]. Seaweed nutritional composition varies greatly depending on species, location, and growing conditions, yet these are highly valuable sources of macro- and micronutrients [1]. Generally, red seaweeds have the highest protein content (14-47% dry weight) [1]. Seaweed proteins also contain significant levels of essential amino acids, which are required for protein synthesis, tissue repair and nutrient absorption [1,3]. The aim of this study was to compare the amino acid profile and the protein quality of two seaweed species: *Porphyra dioica* and *Porphyra umbilicalis*.

Material and Methods

Both seaweed species were produced in Portugal, in an integrated multitrophic aquaculture system. For tryptophan quantification, samples were hydrolyzed under alkaline conditions (4 M KOH, 110 °C, 4h). For the remaining amino acids, acid hydrolysis (6 M HCl, 110 °C, 24h) was performed. Analysis were performed in triplicate. The hydrolysates were neutralized, submitted to an automated online derivatization with OPA and FMOC and analyzed by RP-HPLC/FLD. Amino acids were identified by comparing their retention times with those of known standards and quantified by the internal standard method using calibration curves obtained for each compound. The assessment of the protein quality of the samples was performed based on their amino acid score (AAS) and essential amino acid index (EAAI).

Results and Discussion

The results show that both *Porphyra* species are complete protein sources with similar amino acid contents, with the exception of glutamic acid, serine, glycine, tyrosine, and phenylalanine, which were significantly higher (p<0.05) in *P. dioica*. However, the protein content, determined as the sum of total amino acids, was similar between species (203.99 and 193.34 mg/g dried sample, in *P. dioica* and *P. umbilicalis*, respectively). The protein quality of *P. umbilicalis* (96.53% EAAI) exceeded that of *P. dioica* (90.77%

EAAI), that is, it exhibited an amino acid profile closer to the reference protein [4]. Tryptophan and methionine were the first limiting amino acids of *P. dioica* and *P. umbilicalis*, respectively.

Conclusion

In sum, the protein content of both *Porphyra* species was comparable to that of protein-rich plant-based foods. Moreover, according to FAO/WHO/UNU standards, these seaweeds presented a high-quality protein profile. These results demonstrate that seaweed can play a significant role in global food security. Further nutritional research and product development will be required to increase the commercialization of this food.

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