Optimization of hydrothermal hydrolysis of fish by-products for obtaining bioactive protein enriched hydrolysates

ROCHA C. (1,2), MARQUES B. (1,2), RIBEIRO T. (3), PINTADO M. (3), TEIXEIRA J. (1,2)
1 Centre of Biological Engineering, University of Minho, Braga, Portugal
2 LABBELS Associate Laboratory, University of Minho, Braga, Portugal
3 Universidade Catica Portuguesa, CBQF - Centro de Biotecnologia e Quica Fina Laboratio Associado, Porto, Portugal

Fish by-products produced from fishing industry are estimated to represent 60 % (by mass) of total processed fish. These products are rich in proteins (49 to 57 % by mass), which could be further used in food and feed nutrition or nutraceuticals. Hydrolysis can be used to solubilize and increase the digestibility of these proteins. Further, the resulting protein hydrolysates frequently present interesting bioactive features and functional properties, commonly ascribed to the liberation of bioactive peptides.
The present work aimed at the optimization of hydrothermal hydrolysis treatment parameters for the preparation of bioactive fish protein hydrolysates from industry by-products. Samples were previously grinded and de-oiled by centrifugation. Initially, time and temperature were the parameters considered in order to achieve an optimal condition. Further process intensification was made considering different solid loads to increase the process feasibility. Biomass solubilization yields were determined gravimetrically and all end products were analyzed for their ash and protein contents. Peptides' profile in the hydrolysates was evaluated by high performance liquid chromatography (HPLC). Bioactivity of hydrolysates were also assessed in vitro considering antioxidant and antihypertensive activities using colorimetric assays. Results showed that solubilization yields ranged from 40 to 85 % and the hydrolysates produced have high protein content (ranging from 60 to 95 % w/w), with interesting nutritional and antioxidant features. The protein solubilization and hydrolysis patterns are in accordance with the peptides' profiles obtained.
Hydrothermal hydrolysis of fish by-products resulted in the production of hydrolysates with potential applications in human or animal nutrition, using a potentially environmentally friendly and easily scalable process. However, the final choice of the optimal condition should consider a balance between feasibility, bioactivity, functionality, expected bitterness and environmental impact (including energetic costs).

Acknowledgements: The authors would like to thank Sebol - Comércio e Indústria de Sebo S.A. for providing the fish by-products.
Funding: This work was financially supported by Portugal2020, COMPETE2020 and the European Structural and Investment Funds, under the scope of the project HeathyPETFOOD- PetFood formulations for promotion of health and quality of life (POCI-01-0247-FEDER-047073).