ECSOC-29

2025

Conference

Marine By-Product Valorization: Collagen Extraction from Sardine Scales for Circular Cosmetics and Nutrition

Rebeca André[1,2*], Márcia Santos Filipe[1], Marco Ferreira[3], Marta M. Alves[4], Vânia André[4], Rita Pacheco[2,5], Patrícia Rijo[1,2,6]

[1]CBIOS- Universidade Lusófona's Research Center for Biosciences & Health Technologies, Portugal. [2]Centro de Química Estrutural, Institute of Molecular Sciences, Universidade de Lisboa, Portugal. [3]Pinhais & Cia, Lda, Portugal. [4]Department of Chemical Engineering, Instituto Superior de Engenharia de Lisboa, Portugal. [5]Department of Chemical Engineering, ISEL—Instituto Superior de Engenharia de Lisboa, Lisboa, Portugal. [6]Instituto de Investigação do Medicamento, Faculdade de Farmácia, Universidade de Lisboa, Portugal.

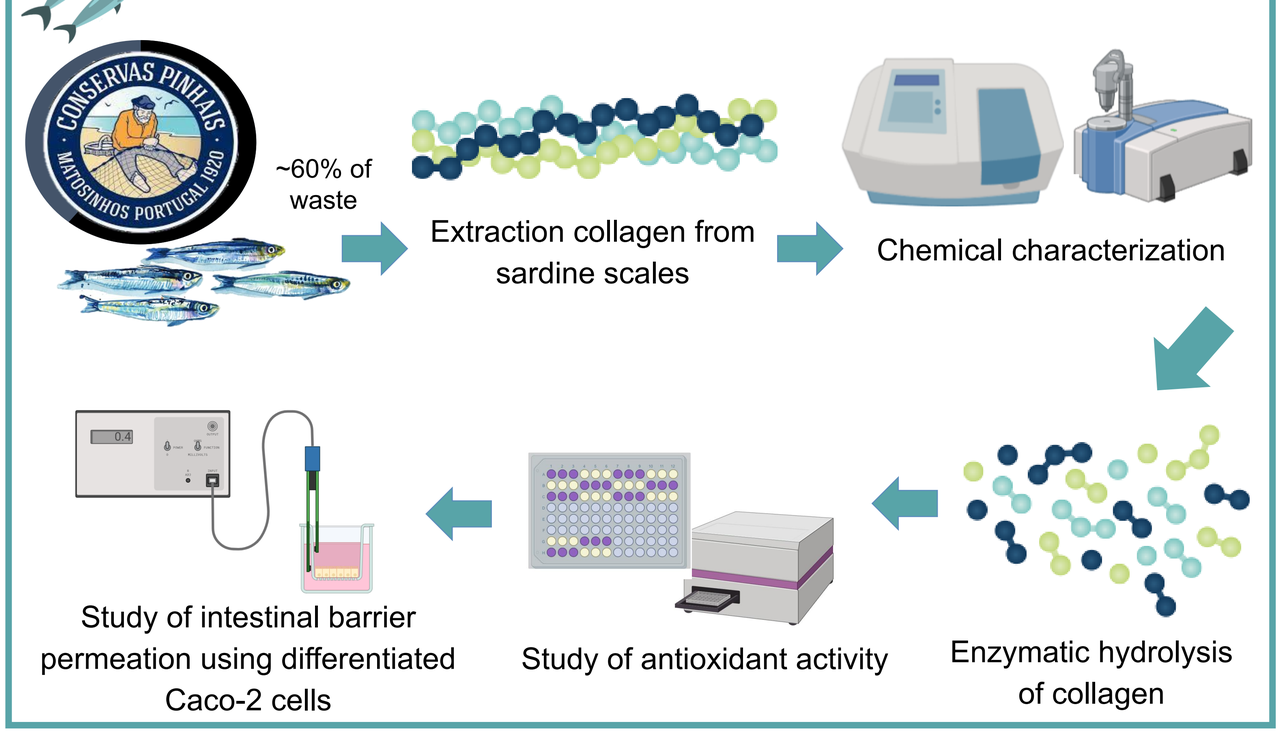
1. INTRODUCTION

In recent years, there has been a significant increase in the amount of waste generated by the canning industry. This situation has sparked growing interest in the use of marine by-products for the extraction of bioactive compounds[1]. This approach not only helps reduce waste but also enables the development of sustainable cosmetics and supplements, adding value to resources that would otherwise be discarded.

2 OBJECTIVE

Extraction of collagen from sardine scales from the canning industry, contributing to the development of a sustainable pharmaceutical market and the circular blue economy.

3. METHODOLOGY



4. RESULTS AND DISCUSSION

Yield of extraction

Acid extraction (ASC): 0,18 %

Pepsin extraction (PSC): 0,55 %

Figure 1. Collagen extracted with acid

Chemical characterization

Confirmation of collagen extraction[2]

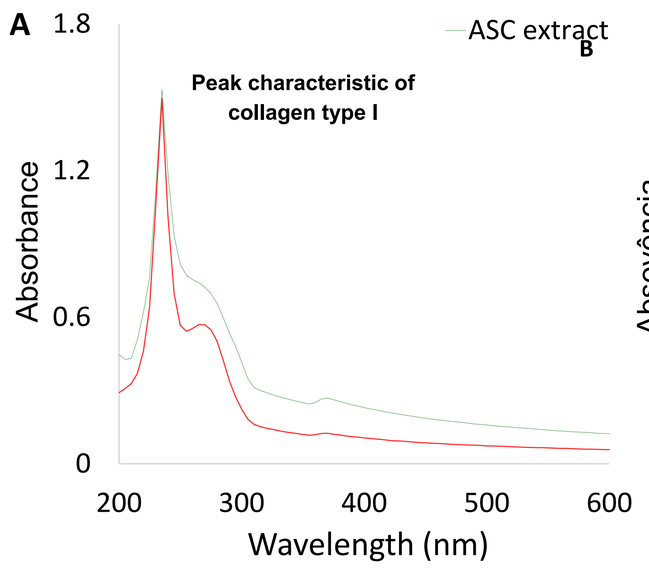


Figure 2. UV-vis (A) and FTIR (B) do extrato spectra of the ASC and PSC extracts

Enzymatic hydrolysis with papain

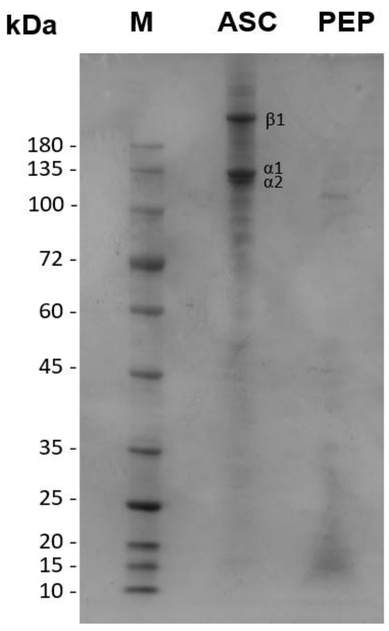


Figure 3. SDS-PAGE of the collagen extract (ASC) and peptides (PEP).

Collagen Type I

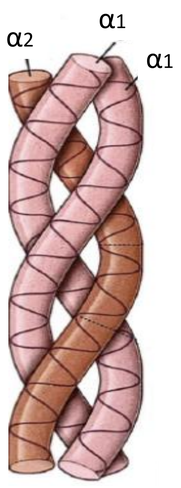


Figure 4. Structure of type I collagen

Antioxidant activity - DPPH

Table 1. Antioxidant activity by the DPPH method of collagen samples (5 mg/mL) and quercetin (0.1 mg/mL).

Sample	Antioxidant Activity (%)
ASC Extratc	5,20 ± 0,38
Collagen peptids	18,91 ± 0,50
Quercetin	95,35 ± 0,82

A direct relationship is observed between the molecular weight of collagen and its antioxidant capacity.

Permeation of intestinal barrier

The peptides showed moderate intestinal permeability in the in vitro model with differentiated Caco-2 cells.

Tabel 2. Apparent permeability coefficient (Papp: cm/s) of collagen peptides (0.5 mg/mL) and caffeine (0.8 mg/mL) using differentiated Caco-2 cells.

Samples	Apparent permeability coefficient (cm/s)
Collagen peptides	5,25 x 10 $^{-6}$
Caffein	26,54 x 10 $^{-6}$

6. CONCLUSION

- This study demonstrates the potential of collagen extracted from sardine scales as a sustainable source of type I collagen, in line with the principles of the blue economy.
- By promoting research and responsible utilization of marine resources, it is possible to drive the development of new pharmaceutical products that benefit both health and the environment.

References

1 - Sruthi, V., Grace, N., Monica, N., Kumar, V. (2020) Marine pharmacology: an ocean to explore novel drugs. International Journal of Basic & Clinical Pharmacology. 9, 5, 822-828. pISSN 2319-2003 | eISSN 2279-0780. DOI: 10.18203/2319-2003.ijbcp20201767

2 – Jaziri AA, Shapawi R, Mokhtar RAM, Noordin WNMd, Huda N. Biochemical and Microstructural Properties of Lizardfish (Saurida tumbil) Scale Collagen Extracted with Various Organic Acids. Gels. 2022 Apr 24;8(5):266.

Acknowledgments

This work was supported by Fundação para a Ciência e Tecnologia (FCT, Portugal) through projects UIDP/04567/2020 and UIDB/04567/2020, and by ILIND through SeedFunding project COFAC/ILIND/CBIOS/1/2022 - Blue4Skin