8th International Solvothermal and Hydrothermal Association Conference
ISHA 2023
Valladolid, Spain
September 10th–13th, 2023

MICROWAVE AQUEOUS EXTRACTION OF SHRIMP SHELL PROTEINS

de-Souza-Ribeiro, M.M.[1,2], Loya-Pérez, H.[1,2], Rodríguez-Rojo, S.[1,2] , Alonso, E.[1,2]

[1]BioEcoUVa, Research Institute on Bioeconomy, PressTech Group, University of Valladolid, Pº Prado de la Magdalena 3-5, 47011, Valladolid, Spain
[2]Dpt. of Chemical Engineering and Environmental Technology, Escuela de Ingenierías Industriales (sede Mergelina), Universidad de Valladolid, Pº Prado de la Magdalena 3-5, 47011, Valladolid, Spain

Corresponding author email: ealonso@uva.es

Abstract

Shrimp production generates the exoskeleton as one of the waste products due to the moulting process of the arthropods[1]. This shell can be valorised by the recovery of chitin, but it also has a high protein content (20-40%)[2] with interest to be isolated. During the conventional chitin extraction process, these obtained proteins cannot be reused, due to the use of inorganic alkaline solvents[3]. In this context, this study aimed to use water as solvent for the extraction of proteins from shrimp molt shells by microwave assisted extraction. The variables temperature (T: 175 and 225 °C), isothermal time (t: 0 and 10), and solvent-feed ratio (S/F: 10, 20 and 40 mL/g) were studied to understand their effects in the extraction of the proteins and co-extraction of other compounds. According to the obtained results, the highest protein extraction yield with low degradation into free amino acids, minimizing the co-extraction of other compounds, was obtained at T = 225 °C, t = 0 min, and S/F = 40 mL/g (protein content: 8.0 ± 0.3%, free amino acids: 0.97 ± 0.02%, and co-extraction yield: 19.8 ± 1.4%), while the lowest protein extraction yield was achieved at T = 225 °C, t = 0 min, and S/F = 10 mL/g (protein content: 2.7 ± 0.7%, free amino acids: 1.103 ± 0.014%, and co-extraction yield: 19.3 ± 1.4%). These results suggest that S/F is a controlling parameter in the extraction of proteins and do not promote neither the co-extraction of other compounds nor the complete hydrolysis of proteins during the microwave assisted aqueous extraction process. Thus, these parameters are being considered in the process optimization study under development nowadays.

Keywords: Amino acids, Molt shell, Protein, Non-conventional process, Microwave process.

References:
*[1] N. Mezzomo, J. Martínez, M. Maraschin and S. R. S. Ferreira, Journal of Supercritical Fluids, 2013, **74**, 22–33.*
*[2] X. Hu, Z. Tian, X. Li, S. Wang, H. Pei, H. Sun and Z. Zhang, ACS Omega, 2020, **5**, 19227–19235.*
*[3] H. El Knidri, R. Belaabed, A. Addaou, A. Laajeb and A. Lahsini, Int J Biol Macromol, 2018, **120**, 1181–1189.*

Acknowledgements: This work was supported by project PID2020-119481RA-I00 from the Spanish Ministry of Science and Innovation, and the program CLU-2019-04 from Regional Government of Castilla y León and FEDER-EU. M.M.S.R thanks the Department of Education of the Regional Government of Castilla y León and the European Social Fund Plus (ESF+) for his doctoral grant.