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The Institute of Bioeconomy of University of Valladolid

21st- 23rd March, Valladolid, SPAIN

2ND GREENERING INTERNATIONAL CONFERENCE

Valladolid (Spain), 21st to 23rd March 2023

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ENCAPSULATION OF RASPBERRY BY-PRODUCT EXTRACT USING PGSS PROCESS

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Polyphenols are secondary metabolites that are synthesized in plants and have biological activities such as antioxidant, anticancer, antimicrobial, and others. Polyphenols, however, show low stability under environmental conditions, such as exposure to light, oxygen, temperature, and enzymatic activities [1]. Therefore, encapsulation of polyphenols could be an alternative for stability and could increase their shelf life. The most widely used microencapsulation techniques include spray-drying, freeze-drying, fluidized bed coating, and coacervation phase separation [2]. One of the encapsulation techniques involving supercritical carbon dioxide is Particles from Gas Saturated Solutions (PGSS) process that shows several advantages for the encapsulation of bioactives such as microcapsules free from solvent traces with high encapsulation efficiencies. The aim of this study was to encapsulate polyphenols obtained from black raspberry press cake (BRPC) using emerging ultrasound-assisted extraction (UAE). UAE was performed using 30% ethanol as solvent at 100% sonication amplitude for 4 min. The extract was encapsulated using the PGSS method with glyceryl monostearate as a carrier under the following process conditions: temperature of 65℃, process time of 15 min, at different pressures (100, 150, and 200 bar) and mass ratios of extract and carrier (E:C) (1:11, 1:5, and 1:3). The encapsulation efficiency (EE) and quantitative HPLC analysis of the initial extract and obtained powders were determined. The results showed that by reducing the concentration of the carrier, the EE decreased. The highest EE of the process (66.76%) was recorded at 200 bar, the E:C 1:11. Also, it was concluded that the EEs were higher when the processes were carried out at higher pressures. The results of HPLC analysis showed that anthocyanins were the dominant compounds in the BRPC extract and powders. The highest concentrations of all compounds were measured when the E:C ratio was 1:3, and the most dominant was cyanidin-rutinoside (5.02 mg/g powder) followed by rutin, cyanidin-glucoside, gallic and ellagic acids. Eventually, BRPC proved to be a valuable source of polyphenolic compounds, while the PGSS encapsulation method proved to be promising for obtaining high-quality powders with preserved active compounds.

Keywords: raspberry press cake, ultrasound-assisted extraction, PGSS, anthocyanins, encapsulation.

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Acknowledgments: This publication is based upon work from COST Action GREENERING, CA18224, supported by COST (European Cooperation in Science and Technology).