COMPARISON OF ULTRASOUND- AND MICROWAVE-ASSISTED EXTRACTION TECHNIQUES FOR THE RECOVERY OF CAROTENOIDS FROM SHRIMPS

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Ultrasound-assisted (UAE) and microwave-assisted (MAE) extraction, which constitute high energy extraction techniques, are novel, fast, highly efficient and widely applied methods for the extraction of bioactive compounds from a variety of matrices and natural products, such as plants, foods and animal tissues [1]. Carotenoids, an important group of fat-soluble pigments with antioxidant and immunomodulatory activity, present in plants and fatty foods, (crustaceans, egg yolks, tomatoes, etc.) are classified by their chemical structures as carotenes, constituted by carbon and hydrogen and xanthophylls which additionally contain oxygen [2]. Xanthophylls, the main carotenoids of crustaceans, can be extracted in a rapid and quantitative way with the use of UAE and MAE.

The principal purpose of the present study was the optimization of the experimental parameters for UAE and MAE using Experimental Design (DOE) and Response Surface Methodology (RSM) models and the comparison of these two techniques for the recovery of carotenoids from the shrimp \textit{A. Antennatus}. Three significant variables for both UAE (extraction time, ultrasound amplitude and solvent/material ratio) and MAE (extraction time, microwave power and solvent/material ratio) were investigated by employing a three-level, three-variable Box-Behnken Design (BBD) [3]. The yield of total carotenoids at the optimum values was determined spectrophotometrically using the calibration curve of a total mix solution of xanthophylls. Total carotenoids content for UAE was 23.4(±2.3) and 6.73(±0.56) mg of carotenoids/100 g dry sample for head and body of shrimp, while for MAE was 23.92(±0.63) and 13.3(±1.1) mg of carotenoids/100 g dry sample, respectively. The recovery of both methods was calculated between 85 and 105%.

KEYWORDS: Carotenoids, Ultrasound-assisted extraction (UAE), Microwave-assisted extraction (MAE), Box-Behnken design (BBD)

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