LIPOSOMAL STABILIZATION OF GRAPE POMACE POLYPHENOLS FOR FUNCTIONAL FOOD MATRICES

Violina POPOVICI[1]*, Rodica STURZA[2], Raisa DRUTA[2], Iurie SUBOTIN[2]
Department of Food and Nutrition, FFT, Technical University of Moldova, Chisinau, Moldova
Department of Oenology and Chemistry, FFT, Technical University of Moldova, Chisinau, Moldova

*Corresponding author: violina.popovici@toap.utm.md

https://doi.org/10.52757/bsd26.53

Background: Grape pomace represents a rich and sustainable source of polyphenols with strong antioxidant and bioactive properties. However, their incorporation into food matrices is often limited by low stability, sensitivity to environmental factors, and reduced functionality during storage. Liposomal encapsulation offers a promising approach to protect polyphenols, enhance their stability, and improve their applicability in functional food matrices.
Aim of the study: To develop and characterize liposomal formulations loaded with grape pomace polyphenols, and to evaluate their encapsulation efficiency, antioxidant activity, and stability during storage for potential application in functional food matrices.
Materials and methods: In this study, liposomal formulations loaded with grape pomace polyphenols were developed using an adapted Mozafari method in an aqueous medium and characterized in terms of particle size, encapsulation efficiency, retention rate, antioxidant activity (DPPH assay), and storage stability over 4 weeks.
Results: The liposomal formulations exhibited nanoscale particle sizes, reaching up to 168.58 ± 2.48 nm, confirming their suitability for incorporation into food systems. High encapsulation efficiency (>80%) and retention rates were achieved, indicating effective incorporation of polyphenols within liposomal structures. The antioxidant activity of encapsulated polyphenols remained significant during storage, demonstrating the protective effect of the phospholipid bilayer against oxidative degradation. After 4 weeks, liposomal systems preserved a considerable proportion of bioactive compounds compared to non-encapsulated extracts.
Conclusions: These findings highlight the potential of liposomal encapsulation as an efficient delivery system for stabilizing grape pomace polyphenols and enhancing their functionality in food matrices. The developed formulations support the valorization of agro-industrial by-products and their application in functional foods with improved bioactive compound retention and nutritional value.

Keywords: liposomal encapsulation; grape pomace polyphenols; functional foods.

Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.