

Developing and assessing Carvacrol nanocarriers by High-pressure homogenization: innovating delivery systems for improved stability and antioxidant activity

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This presentation explores the development of innovative nanocarriers aimed at improving the stability and efficacy of carvacrol, a well-known natural antioxidant derived from thyme oil. Despite its numerous health benefits, carvacrol's low solubility and volatility often limit its practical use.

To address these challenges, the high-pressure homogenization was utilized to create lipid-based nanocarriers that effectively encapsulate carvacrol, enhancing antioxidant activity and stability. This study addresses the formulation and characterization of two nanosystems, namely nanoemulsions and nanostructured lipid carriers (NLCs), loaded with carvacrol. Carvacrol, a bioactive compound with known antimicrobial and antioxidant properties, was chosen as the sole active substance. The nanosystems were prepared using distinct methods and compositions, and their physicochemical properties were characterized. Analysis of particle size, zeta potential, drug loading efficiency, and in morphological analysis revealed differences between the nanoemulsions and NLCs, indicating variations in their formulation and potential applications.

The current research demonstrates that encapsulating essential oils in appropriate carriers significantly improves their antioxidant activity and stability. The primary reason why carvacrol-loaded nanoemulsions increase antioxidant activity is because of their larger surface area and smaller particle size, which improves their ability to interact with free radicals. Nanoemulsions offer advantages in terms of smaller particle size and rapid drug release, making them suitable for applications requiring immediate action. On the other hand, NLCs provide higher drug loading efficiency and controlled release profiles, suggesting potential for sustained therapeutic effects.

Keywords: carvacrol, nanocarriers, high-pressure homogenization, nanoemulsions, NLC, antioxidant.

Mimoza Basholli-Salihu, Aida Loshaj-Shala, Toskë Kryeziu, Rrona Pozhari, Rrona Mehmeti and Fatbardha Halilaj are members of NANOALB research group.

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