Combined supercritical CO_2 extraction and liposomal encapsulation of bioactive compounds from vranac grape skins for topical applications

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Introduction

- Overview of the wine industry's waste problem
  - The wine industry generates substantial amounts of waste, particularly grape pomace, which consists of skins, seeds, and stems.

- Potential of grape pomace as a source of bioactive compounds (resveratrol and quercetin)
  - This study explores the extraction of resveratrol from Serbian Vranac grape skins using supercritical CO_2 and its incorporation into DPPC liposomes for topical use.

- Focus on sustainability and biocircular economy
  - These findings suggest that Vranac grape skin extract, encapsulated in DPPC liposomes, could serve as a stable and effective antioxidant agent for topical applications, with potential uses in cosmetic or dermatological formulations.

Methodology - Extraction

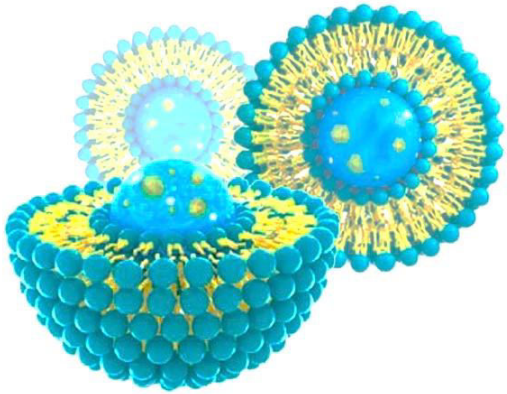
- Supercritical CO_2 Extraction:
  - Conditions: 40°C, 250 bar, 60 minutes
  - Solvent: CO_2 and ethanol as co-solvent
- Freeze-drying and grinding process

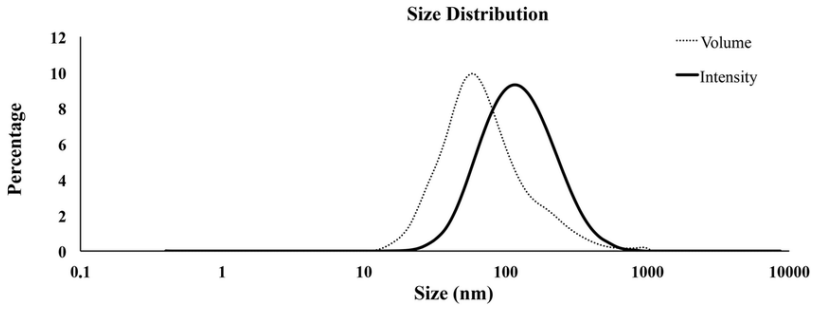
Methodology - Analysis

- Chemical Analysis:
  - Orbitrap mass spectrometry for resveratrol quantification
- Antioxidant Activity Testing:
  - EPR spectroscopy against DPPH, hydroxyl, and superoxide radicals

Methodology - Liposome Preparation

- Thin film sonication method
- Encapsulation using hydrogenated soy lecitl
- Characterization:
  - Dynamic Light Scattering (DLS) for size
  - Zeta potential for surface charge



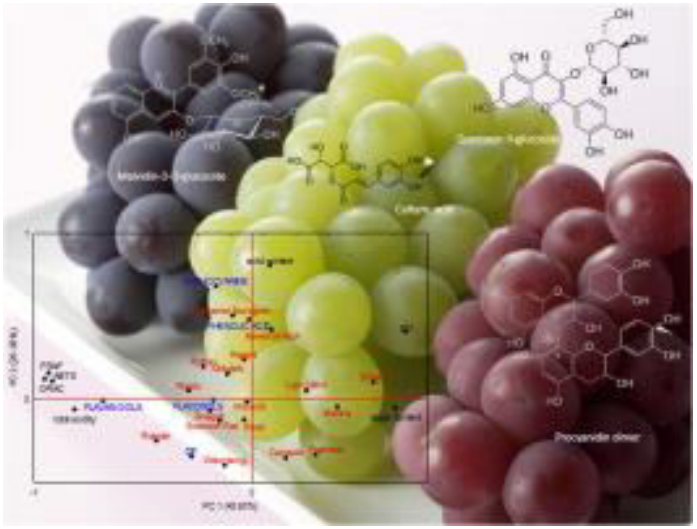


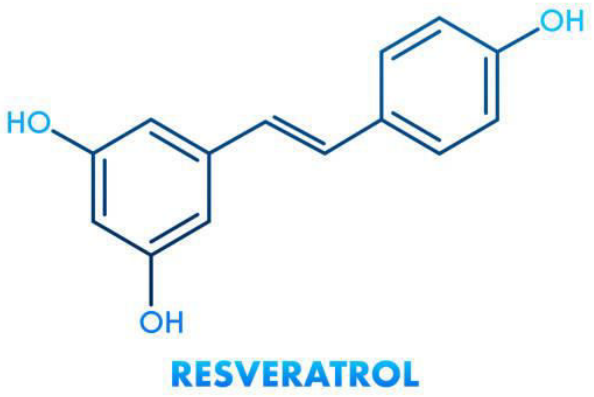
Key Results - Antioxidant Activity

- Sample 1 (50% ethanol extract) demonstrated:

  - Highest activity against DPPH (53.78%), Hydroxyl (86.64%), and Superoxide (84.37%) radicals.

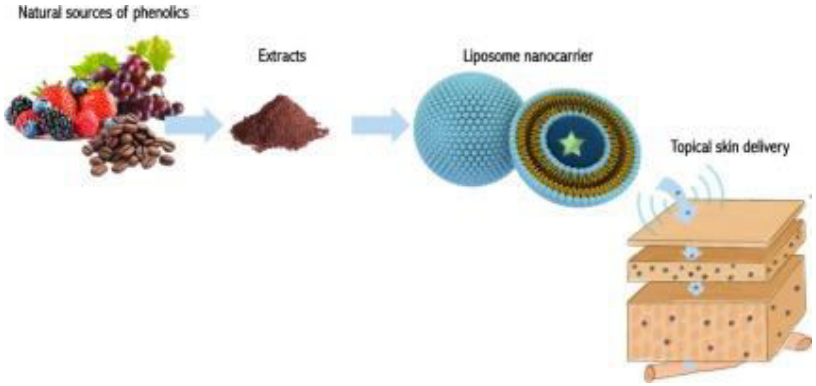
- Significance of using polar solvents for resveratrol extraction

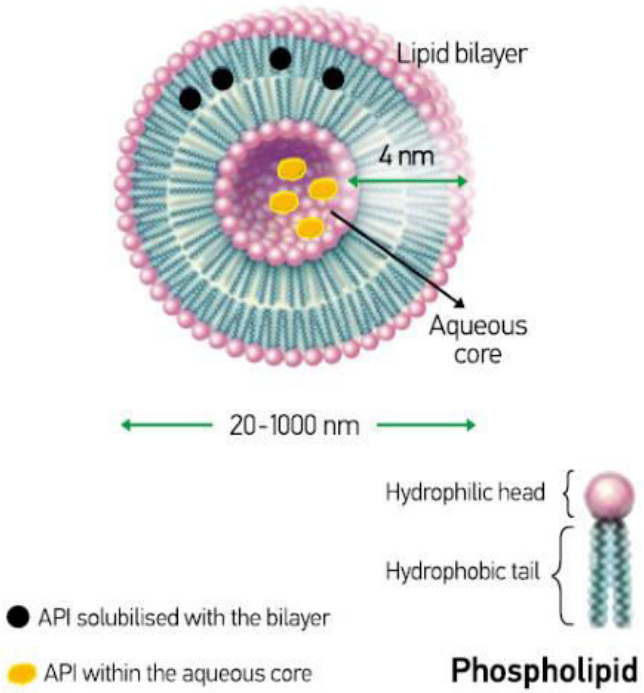




Key Results - Liposomal Formulation

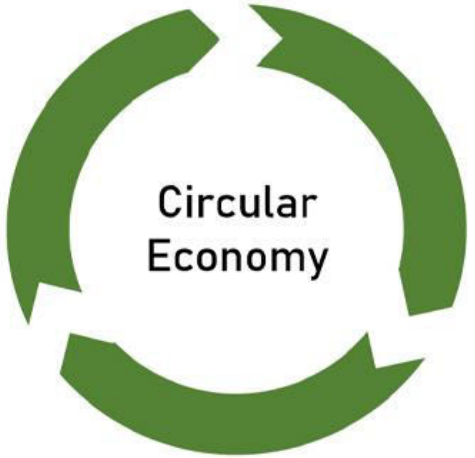
- Encapsulation Outcomes:
  - Liposome size: ~122 nm
  - Stable zeta potential: -20.4 mV
  - Antioxidant activity retained post-encapsulation
- Improved stability and applicability for cosmetics





Implications

- Use of Vranac grape skin extracts in sustainable skincare
- Contribution to environmental sustainability
- Potential applications in anti-aging and wound-healing products



Conclusion and Future Directions

- Confirmation of Vranac extracts as potent antioxidants
- Liposomal encapsulation enhances stability
- Next steps: clinical trials, skin permeability studies, formulation optimization

Thank you