Eugenol Pickering emulsion stabilized by chitosan self-assembled nanoparticles: fabrication, emulsion stability, antioxidant and antimicrobial activity

By Abd Hamid, KH (Abd Hamid, Khadijah Husna) ; Fauzi, MA (Fauzi, Muhammad Ashraf) ; Ajit, A (Ajit, Azilah) ; Arzmi, MH (Arzmi, Mohd Hafiz) ; Azman, NAM (Azman, Nurul Aini Mohd)

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Source JOURNAL OF CHEMICAL TECHNOLOGY AND BIOTECHNOLOGY
Volume: 100 Issue: 12 Page: 2616-2624 Special Issue: SI
DOI: 10.1002/jctb.7905

Published DEC 2025

Early Access MAY 2025

Indexed 2025-06-04

Document Type Article

Abstract BackgroundEugenol, an important active ingredient in essential oils, effectively inhibits food-borne pathogens but is hindered by its high volatility. Pickering emulsion provides a suitable method to encapsulate, protect and enhance the absorption of these biologically active food components. This study investigated encapsulation of different concentrations of eugenol Pickering

emulsion stabilized with self-assembled chitosan nanoparticles by ultrasound-assisted emulsification. The effects of varying eugenol concentrations on Pickering emulsions' physical, stability, antioxidant and antimicrobial properties were analyzed.ResultsThe integration of eugenol at different concentrations increased the droplet size of Pickering emulsion, and the value ranged from 20 to 142 nm during a 60-day storage. Eugenol (5%) significantly improved the antioxidant activity of the Pickering emulsion with a DPPH (2,2-diphenyl-1-picrylhydrazyl) value of 78%. In addition, eugenol effectively increased the antimicrobial activity of the Pickering emulsion against Staphylococcus aureus (S. aureus) and Escherichia coli (E. coli) with inhibition zones of 14.1 and 17 mm, respectively. The stability of the Pickering emulsion increased with the increase in eugenol concentration throughout the storage period.ConclusionPickering emulsions stabilized with self-assembled chitosan nanoparticles effectively enhanced the stability, antioxidant, and antimicrobial performance of eugenol. These results highlight the potential of such systems as natural and efficient delivery platforms for food and pharmaceutical applications. (c) 2025 Society of Chemical Industry (SCI).

Keywords

Author Keywords: Pickering emulsion; eugenol; antioxidant; stability; antimicrobial

Keywords Plus: DELIVERY; OIL

Addresses

[1] Univ Malaysia Pahang Al Sultan Abdullah, Fac Chem & Proc Engn Technol, Kuantan, Malaysia

[2] Univ Malaysia Pahang Al Sultan Abdullah, Fac Ind Management, Kuantan, Malaysia

[3] Int Islamic Univ Malaysia, Dept Fundamental Dent & Med Sci, Kulliyyah Dent, Kuantan, Malaysia

Categories/ Classification

Research Areas: Biotechnology & Applied Microbiology; Chemistry; Engineering

Citation Topics: 2 Chemistry › 2.53 Polymers & Macromolecules › 2.53.2046 Pickering Emulsions

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