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Perspective

Properties and Stability of Nanoemulsions in Rosemary Essential Oil

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ABOUT THE STUDY

Nanoemulsions can shield bioactive chemicals during digestion and increase their bioaccessibility; nanoemulsions have been referred to as carriers of bioactive substances. However, the nanoemulsion composition, particularly have the lipid phase properties, can have an impact on their stability and bioaccessibility. As a result, this sought to assess the sustainability and bioaccessibility of -tocopherol contained in nanoemulsions using three distinct carrier oils (avocado, flaxseed, and chia). We identified the particle properties (Particle Size (PS) and Polydispersity Index (PdI)), oxidative stability, and degradation of -tocopherol during storage of nanoemulsions. Additionally, the *in vitro* digestion's Free Fatty Acid (FFA) release kinetics and -tocopherol bioaccessibility were examined. The findings revealed that all nanoemulsions are colloidally stable since there was no phase separation and their droplet properties were PS 200 nm and PdI 0.2.

Due to the high concentration of monounsaturated and saturated fatty acids in Avocado Oil (AVO) nanoemulsion, it was the most resistant to oxidation, but CHI nanoemulsion had the maximum chemical stability of -tocopherol during storage. Additionally, AVO nanoemulsion had the greatest -tocopherol bioaccessibility (81%) and the most substantial FFA release (94%). The chemical stability and bioaccessibility of -tocopherol contained in nanoemulsions are influenced by the kind of oil. In order to boost the bioaccessibility of fat-soluble vitamins during digestion, AVO oil can be employed as a carrier of these nutrients. On the other hand, sonication was used to create nanoemulsions of Rosemary Essential Oil (REO) with a range of droplet sizes. Researchers looked at the effects of incorporating REO nanoemulsions with the smallest and biggest droplet sizes at various concentrations (0.5, 1, 2, and 4% v/v) in a film made of Eremurus Luteus Root Gum (ELRG) on the film's physicochemical, barrier, mechanical, and antioxidant properties. Additionally, the impact of nanoemulsion particle size and concentration on their retention in the film structure during storage at 25°C was assessed. The findings showed that as REO nanoemulsion concentration grew, their moisture content, solubility, tensile strength, and elastic modulus dropped while their contact angle, Water Vapour Permeability (WVP), and elongation at break increased.

The active films had higher opacity, yellowness, and E values than the control film, according to the examination of colour properties of films. The hydrogen bonding interactions between films constituents at the molecular level were shown by the Fourier Transform Infrared (FTIR) spectra. Following the addition of REO nanoemulsions, the dried active films were shown in the SEM images to have irregular and spongy architectures. By increasing the amount and width of the droplets of REO nanoemulsions, the loss of REO in dried films was increased. The inclusion of films containing 3% REO nanoemulsion resulted in the greatest bacterial growth suppression. After the addition of REO, the antioxidant of the ELRG film increased from 16.35 to 42.78%.

CONCLUSION

In general, the density of REO emulsions had a greater impact on several of the features of the activated Eremurus Luteus Root Gum (ELRG) films than their particle diameter. The findings suggest that these disposable ELRG active films may one day be used as edible packaging to extend the shelf life of food. An effective working fluid is essential to oil recovery, which is becoming increasingly crucial as the oil industry develops. Nanoemulsions have gotten a lot of interest among them. Moreover, how the oil recovery procedure is impacted by nanoemulsions' features.

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