

Heated and unheated lupin protein-grape seed extract conjugates stabilizing and structuring high internal phase oil-in-water emulsions

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Abstract

Plant-based high internal phase oil-in-water emulsions (HIPEs) are promising fat replacers. However, producing stable HIPEs with improved viscoelastic properties is a challenge for the food industry. Conjugation of plant proteins, such as lupin protein isolate, with phenolic compounds, such as proanthocyanidins from grape seed extract, associated (or not) with moderate heat treatment arise as potential methods to tune the surface properties of proteins and, consequently, the droplet-droplet interactions that drive the viscoelastic properties of HIPEs. In this way, unheated (UHC) and heated (85°C, 15 min) (HC) lupin protein (LPI)-grape seed extract (GSE) conjugates were produced and used to stabilize high internal phase oil-in-water emulsions. Evaluation of stability by Turbiscan and oil loss by centrifugation over 56 days of storage did not reflect the kinetic stability of HIPEs against process conditions. Under shearing, UHC-stabilized emulsions at high GSE concentrations showed oil release, whereas all HC-stabilized HIPEs released oil. However, the increase in GSE concentration and heat treatment improved the viscosity and storage modulus (G') of HIPEs, possibly due to the droplet-droplet interaction originating from hydrophilic and hydrophobic interactions in UHC and HC-stabilized HIPEs, respectively. This pivotal study confirmed that conjugation of a plant protein with GSE and heat treatment could improve the viscoelastic properties of high internal phase oil-in-water emulsions and produce HIPEs with superior texture (higher G').

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