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Title:

Impact of various physical treatments on physicochemical and microstructural characteristics of vegetable oil-based whipped cream stabilised by faba bean protein isolate

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text into it.)

Preparation of Your Abstract

1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word ONLY (place names excluded). No full stop at the end.
2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

Introduction: Clearly state the purpose of the abstract
Methods: Describe your selection of observations or experimental subjects clearly
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Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

In this study, faba bean protein isolate (FPI) aggregates, prepared through various treatments including conventional heating (CH), ultrasonication (US), and thermosonication (TS), were used to formulate plant-based whipped creams. The objective is to develop a clean-label and dairy-free whipped cream using vegetable oil and plant proteins. The effects of these treatments on the characteristics of FPI aggregates and the oil-in-water (O/W) emulsions made from them, both before and after whipping, were evaluated. Among the different treatments, TS was the most effective at denaturing and unfolding FPI molecules, resulting in the formation of extended, strand-like aggregates with the highest surface hydrophobicity and solubility. These strand-like aggregates, potentially formed by disulfide bonds, were confirmed through sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE). In contrast, untreated and CH-treated FPI samples formed large aggregates with low solubility and surface hydrophobicity. Moreover, emulsions stabilised by TS-treated FPI exhibited the smallest oil droplet size and the greatest mechanical strength, leading to superior whipping performance, with the highest overrun and lowest serum release. The strand-like aggregates formed by TS had a higher aspect ratio than the particle aggregates, facilitating better interfacial absorption, coverage, and the formation of a network structure. This enhanced the entrapment and stabilisation of air bubbles, contributing to improved whipping capability and stability. This study highlights TS-treated FPI as a promising ingredient for formulating plant-based whipped creams and aerated emulsions. Future research could explore other plant protein ingredients and improving organoleptic properties of plant-based whipped creams such as mimicking milk fat's melting behaviour.