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Title:

Stability of faba bean protein stabilised emulsions: from storage to oral processing

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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

Results: Present your results in a logical sequence

Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

The growing demand for nutritious and sustainable dairy alternatives is driving interest in functional plant-based proteins. Faba bean (*Vicia faba* L.), an abundant legume crop in Australia, offers high protein content and low allergenicity, yet its application in value-added products is limited by insufficient understanding of its techno-functional properties. These properties vary significantly with protein extraction method and solution environment.

This study compares emulsions stabilised with Australian faba bean proteins extracted by dry fractionation to form a concentrate (FBC), and by isoelectric precipitation to form an isolate (FBI). Emulsion structure and stability are investigated with oils of varying fatty acid profiles (olive, canola, sunflower and flaxseed) after one- and four-days storage. The in-use case is investigated for calcium fortified emulsions upon addition to coffee. Emulsions were evaluated using rheology, particle size distribution, and zeta potential.

With FBI, sunflower and olive oil emulsions exhibited the greatest increase in droplet size from day 1 to day 4. A concurrent increase in viscosity and shear thinning from day 1 to 4 suggested aggregation and increased droplet interactions with storage. In contrast, FBC stabilised emulsions with canola, olive and sunflower oil showed little change during storage. These trends are not explained by oil fatty acid profile. When added to coffee FBI emulsions with 0, 1, 2 mM CaCl₂ showed a significant increase in droplet size that indicates aggregation, which was not observed with FBC. At pH 3.3. there is no significant difference in zeta potential between FBC and FBI, suggesting that emulsion stability is not only a function of protein structure.

These findings demonstrate that both protein extraction method and environmental factors—including oil type and calcium concentration—critically influence emulsion stability. This highlights the importance of and informs tailored ingredient selection for the development of robust plant-protein-based emulsions in complex food systems.