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Title:

Exploring refined, semi-refined, and unrefined plant proteins in structuring food analogues using high-temperature shear processing technology

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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

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The structuring of plant-based meat analogues relies on the ingredients' functionality and protein-protein interactions during thermomechanical processing. This study investigated the physicochemical, thermal, and techno-functional properties of refined, semi-refined and unrefined derivatives of an emerging legume, faba bean. Flour, protein concentrates, and isolates were evaluated for their water- and oil-holding capacities, key determinants of texture and quality. Differential Scanning Calorimetry revealed thermal transitions at approximately 89°C for isolates and 98°C for concentrates, primarily due to 7S vicilin and 11S legumin protein denaturation. Flour exhibited two transitions: starch gelatinisation at approximately 73°C and 11S legumin protein denaturation at approximately 100 °C. High thermal transition temperatures indicate suitability for thermomechanical processing. Despite lower protein content, faba bean flour outperformed faba bean protein concentrates and isolates in functional properties, such as foaming and emulsification stability, gelation, and solubility. Structured meat analogues were then developed using a thermomechanical process (patent pending) from combinations of faba bean, soy protein isolates, pea and faba bean concentrates, faba bean flour and corn starch; the control contained soy protein isolate, pea protein concentrate, and corn starch. Faba bean flour, rich in endogenous starch, fibre, and protein, was hypothesised to replace corn starch, improving structure and nutrition. Fourier Transform Infra-Red Spectroscopy (FTIR) assessments showed that corn starch-based formulations promoted higher β-sheets and β-turns content. In contrast, meat analogues made with faba bean flour displayed increased β-turns and fewer β-sheets compared to the control. These conformational differences are likely to arise from the complex proteins and starches in whole flour disrupting β-sheet formation and stability, unlike simpler corn starch-protein systems. Textural analysis confirmed this, as corn starch-based analogues showed greater hardness, chewiness, and cutting strength. Overall, these findings demonstrate that refined, semi-refined, and unrefined faba bean ingredients are promising alternatives to commercially used plant proteins in meat analogue development.