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Title:

Molecular modifications of plant proteins-consequences for structure and functionality

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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

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The increasing demand for plant-based proteins in the food industry is driven by sustainability, nutritional benefits, and minimal religious or ethical constraints. However, native plant proteins, such as hemp protein, often exhibit poor solubility and limited functional properties. This study explores the phosphorylation of hemp protein isolate using sodium trimetaphosphate (STMP) to enhance its techno-functional potential.

Hempseed meal, locally sourced and ground, was found to contain 30.48 ± 0.1% protein (Kjeldahl method). Protein extraction was performed via alkaline extraction–isoelectric precipitation (AE–IEP), yielding approximately 83% protein. Phosphorylation was conducted at pH 12, 50 °C, using 3% STMP (w/v) for 3 hours. A dry-ashing colorimetric method confirmed successful phosphorylation through increased phosphorus content after phosphorylation.

Nano-DSC revealed a denaturation temperature of ~81 °C in the untreated sample, while no clear peak was observed in the phosphorylated protein, suggesting structural denaturation. SDS-PAGE analysis showed bands near 30 kDa and 20 kDa, corresponding to the acidic and basic edestin subunits. Phosphorylated samples displayed lighter, slightly shifted bands, indicating structural changes due to phosphorylation, possibly from subunit dissociation rather than cross-linking. The phosphorylation process may have led to partial breakdown of the protein structure. Therefore, further optimization methods may be required.

Ongoing investigation will explore the effects of the modification on the structure and properties of the hemp protein using DSC, FTIR, particle size analysis, and surface tensiometry. The method's feasibility will be determined by mass spectrometry. The technical functionality of the modified protein, including solubility, emulsification, foaming, viscosity, gelation, and thermal stability, will be investigated for food product design.