Improvement of functional properties of hemp proteins by chemical and enzymatic modifications

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Rapid population growth will increase demand for protein-rich foods. Plant proteins offer a cost-effective, nutritious alternative with lower saturated fat content that meets daily nutritional needs while supporting modern dietary trends that emphasise health, wellness and sustainable food choices [1,2]. Hemp (Cannabis sativa L.) oilseed is gaining attention as a multipurpose crop with low environmental impact that contains low levels of Δ9-tetrahydrocannabinol (THC, <0.1–1%). This is because, unlike most oilseeds, hemp oilseeds are low in anti-nutritional compounds and the protein extracted from the oilseed cake after oil extraction, has a rich nutritional protein profile comparable to egg white and soybean [3].
The potential use of protein in food applications depends largely on its functional properties. The structure of a protein is crucial in determining its functionality as it is influenced by hydrophobic, non-covalent and electrostatic interactions. Physical, chemical, and biological techniques can be used to modify protein structure [4].
This study investigated the impact of chemical lyophilization (acylation using fatty acid chloride) and enzymatic cross-linking (using microbial transglutaminase) on the functional properties of hemp protein. Dynamic light scattering (DLS) and zeta potential analysis revealed different responses to various modification methods in terms of changes in particle size and surface charge. The water- and oil-holding capacity, foaming ability, emulsion activity, and stability were all higher for the chemically or enzymatically modified proteins than for the unmodified proteins. This demonstrates the improved functionality and enhanced applicability of these proteins.

Keywords:
Plant Proteins, Protein Modification, Functional Properties

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