

Effects of Enzyme Supplementation on The Physicochemical Properties and Structural Characteristics of Pea Protein-Based Plant Meat

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Abstract

Pea protein, due to its low allergenicity, high protein content, accessibility, and origin from sustainable crops, is regarded in the food industry as a high-quality protein and functional ingredient; however, its sensory properties still require improvement. Therefore, this report aims to investigate the use of enzymatic treatment to enhance the texture and physicochemical properties of plant proteins, and to evaluate the structural impact following the production of plant-based meat via high-moisture extrusion technology (HMET). Five different enzymatic combinations were applied, including hydrolytic enzymes such as pepsin or papain; the cross-linking enzyme transglutaminase (TG) ; and their combinations: Pepsin + TG or Papain + TG, to improve the surface and functional properties of pea protein and its three blended variants (rice, oat, and hemp proteins). The results showed that pepsin increased the solubility of pure pea protein (51.5%), while Papain + TG enhanced the solubility of the pea-hemp blend (56.6%) ; TG improved the emulsion stability of the pea-rice blend (41%) ; and papain promoted the foaming capacity of the pea - oat and pea - hemp mixtures, reaching 243.3% and 286.7%, respectively. In terms of plant-based meat processing, the addition of 0.2% ~ 0.3% TG strengthened covalent cross-linking, and the inclusion of 0.3% TG significantly improved the hardness and fibrousness of the final product ; however, excessive addition was detrimental to structural formation. In summary, TG supplementation can optimize the quality of pea protein-based plant meat, demonstrating the commercial potential of plant proteins.

Reference

- Tang YR, Stone AK, Wang Y, Jafarian Z, Zhou L, Kimmel J, House JD, Tanaka T, Nickerson MT (2023) Effects of enzyme treatments on the functionality of commercial pea and pea blended protein ingredients. *Food Bioscience*, 53:102838.
- Yu X, Li T, Yue M, Zhang S, Zhang Y, Wang X, Zhao Y, Wu J, Wang C, Ma C (2025) Impact of transglutaminase on structural and rheological properties of pea protein-cornmeal-wheat gluten blends for meat analogue production. *Journal of Food Engineering*, 390:112412.