Impact of Enzymatic Hydrolysis of Almond Protein on Its Functional Characteristics

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Impact on California Agriculture: Almond production plays a crucial role in California's agricultural sector, offering a sustainable source of plant-based protein. With a growing consumer demand for health-conscious and environmentally sustainable food sources, almonds emerge as a promising protein source. This could support a transition towards more sustainable and nutritious food products, potentially benefiting almond growers and processors economically.

Rationale/Introduction: The limited functionality of almond proteins is due to their large molecular weight which lead to a poor solubility and capabilities in emulsification and foaming which restricts their wider use in the food industry. By enhancing these properties through enzymatic hydrolysis, this study aims to boost the marketability of almond proteins. This study explores the potential of enzymatic hydrolysis using papain and bromelain, to improve the functionalities of almond proteins. This research lays the foundation for the development of innovative food products enriched with enhanced almond proteins.

Experimental Approach: This research employs an in-depth methodology that includes Size Exclusion High-Performance Liquid Chromatography (SE-HPLC) and a variety of functionality tests to investigate the molecular alterations in almond proteins following enzymatic hydrolysis. The study focuses on the changes in solubility, emulsification, and foaming capacity, among other properties, of the hydrolyzed almond proteins. Furthermore, it assesses the impact of enzymatic treatment on the Protein Digestibility Corrected Amino Acid Score (PDCAAS), aiming to improve the nutritional value of almond proteins. Identifying the optimal conditions for enzymatic hydrolysis is a pivotal aspect of this research.

Results: Preliminary findings suggest that enzymatic hydrolysis using papain (PP220) enhances the solubility of almond proteins, as evidenced by absorbance readings at 540 nm (Biuret method) and 280 nm (UV method). Distinct trends were observed between the two methods, necessitating additional inquiry. Nevertheless, the data demonstrated a positive correlation between protein solubility and both pH and temperature levels. Specifically, enzyme treatment resulted in a notable 38% enhancement in almond protein solubility at 50°C. Ongoing investigations employing HPLC aim to elucidate potential molecular structural alterations in almond proteins.

Conclusion: This study demonstrates the potential of enzymatic hydrolysis to enhance the solubility of almond proteins, which can be a key step towards broadening their application in the food industry. By improving solubility, and potentially other functionalities like emulsification and foaming capacity, enzymatically hydrolyzed almond proteins can meet the growing consumer demand for plant-based proteins that are both nutritious and versatile in food products. The optimal conditions for hydrolysis will be a valuable guide for future research and application in food science. This not only paves the way for the development of innovative, almond-based food products but also contributes to a more sustainable and profitable agricultural sector in California.

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