Non-Thermal Ultrasound Drying (US) to Enhance the Solubility of Almond, Lentil and Pea Proteins

[1]Nahla Kreidly and [1]Graciela Wild Padua

[1]Department of Food Science and Human Nutrition

University of Illinois at Urbana-Champaign

Kreidly2@illinois.edu

Increasing consumer demand for high quality protein-rich products highlights the need for the development of non-thermal innovative approaches to food processing. Novel, plant protein products are currently of high interest due to consumers' preference over the use of animal proteins, but the functionality of plant proteins remains a challenge. Ultrasound (US) has become a technology of interest to the food industry due to its ability to remove water and solvents without significantly raising the temperature of the load.

The effect of ultrasound drying of vegetable protein gels on the solubility of resulting dried proteins was investigated. Protein gels were prepared by hydrating almond, lentil, and pea protein powders (10-20% w/v) for 2 hours. Ethanol (30-80% v/v) was then added to the protein solution. Viscoelastic properties of ethanol-induced gels were determined with an ARES-G2 rheometer. All proteins formed instantons gels immediately upon contact with ethanol.

Ultra-sound drying of protein gels was performed with a custom-designed system consisting of transducer box that vibrated at 40 kHz to facilitate vibrational moisture removal. The transducer box was submerged in a custom-designed water jacket for temperature control. Drying temperature was 28C, drying time was 8 minutes. Final moisture content was ~1% and residual ethanol was 0.001 mg/g.

Structural differences were investigated by SEM. US drying formed thin films with a uniform structure while air drying formed an unstable semi-porous structure. US significantly enhanced the solubility of plant protein gels.

This work aims to enhance the functionality of vegetable protein powders by using non-thermal processing.

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