United States Department of Agriculture
Project Initiation

Project Data for Accession Number 1032496

Project Title

Ultrasound and Fermentation Assisted Pulse Protein fractionation: A Novel Method to Extract High-quality and Functional Plant Proteins.

Project Details

Sponsoring Institution National Institute of Food and Agriculture	**Project Status** ACTIVE
Funding Source NIFA Non Formula	**Grant Year** 2024
Grant No. 2024-67018-42814	**Cumulative Award Amt.** $299,736.00
Proposal No. 2023-10525	**Multistate No.** (N/A)
Project Start Date Aug 01, 2024	**Project End Date** Jul 31, 2027
Program Code [A1364] Innovations in Food Manufacturing Technologies	

Project Director

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Recipient Organization

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Performing Department

(N/A)

Non Technical Summary

The plant-based dairy and meat market is booming, estimated to be worth $29 billion in 2023 and growing by about 8% annually. This reflects the rising global demand for alternative proteins, including various plant-based sources. Scientists are now focusing on developing new ingredients from cereals, pulses, and microbes, with improved functional properties. However, traditional protein extraction methods, which involve alkaline pH and isoelectric precipitation, often result in lower yields and reduced protein quality in terms of functionality, taste, and nutrition. The traditional method also requires large amounts of chemicals, which is not sustainable. This project aims to develop an eco-friendly method for fractionating plant proteins to enhance consumer acceptance by improving functionalities, taste, and nutritional value. It will utilize ultrasound and fermentation technologies to extract proteins from pulse flour, increasing yield and improving protein quality. The research will focus on optimizing ultrasound-assisted extraction to

release proteins from flour efficiently, followed by adjusting fermentation-assisted precipitation to remove off-flavors and antinutritional factors. The effectiveness of the new method will be compared with traditional extraction methods in terms of protein yield, removal of off-notes, and reduction of antinutritional compounds. The successful completion of this project is expected to result in a new method for fractionating proteins that addresses all issues related to pulse protein. The method would have a lower environmental impact, potentially reducing emissions using less land and water than traditional meat. Therefore, this project could play a crucial role in ensuring the long-term sustainability of U. S. agriculture and food systems.

Animal Health Component

Animal Health Component: 0%

Research Effort Categories

Basic	25%
Applied	50%
Developmental	25%

Classification

Knowledge Area (KA)	Subject of Investigation (SOI)	Field of Science (FOS)	Percent
501	1410	1010	100%

Knowledge Area

[501] New and Improved Food Processing Technologies

Subject Of Investigation

[1410] Beans (dry)

Field Of Science

[1010] Nutrition and metabolism

Keywords

Plant protein fractionation structure functionality fermentation ultrasound off-flavor meat cheese

Goals / Objectives

The overall goal of this proposed project is to provide an eco-friendly approach to fractionating plant proteins to enhance consumer acceptance by improving functionalities, taste, and nutritional value.The goal of this proposed project will be achieved through two supporting objectives: Objective 1. Optimize the ultrasound process to release protein in the extracting solution (water) and identify the best lactic acid bacteria strain(s) based on protein precipitation and off-notes removal efficiency. Objective 2. Perform head-to-head comparison of the quality of proteins isolated through newly proposed and traditional method

Project Methods

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Ultrasound-assisted protein extraction will be optimized by measuring protein release rate in the extracting aqueous solution. Second, lactic acid bacteria strain (LAB) strains will be identified based on the literature review and the best LAB(s) will be identified based on the protein precipitation and off-notes removal efficiency. Third, a sufficient amount of protein isolate will be prepared to measure molecular structure, functional properties, and anti-nutritional and nutritional properties.