Tapping the Potential of Pulse Proteins: From Refinement Extraction to its Protein Functionality

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ABSTRACT:
It is estimated that about 70% more food will be required to feed the growing world population, which is predicted to reach almost 10 billion by 2050. The challenge will be how to meet this increasing global food demand, particularly the consumption of proteins that are essential components for human life, while still achieving environmental sustainability. Pulses are recognized as complementary ingredients to tackle this challenge. Proteins extracted from these materials play a vital role as functional ingredients and are key drivers to creating a sustainable food future. Nonetheless, using these proteins can present challenges, especially when they are to replace the functionalities of animal-based ingredients, such as milk or eggs. Hence, it is pertinent to understand the functional properties of these proteins in order to utilize them efficiently in plant-based food products. In this presentation, properties of proteins extracted from two underutilized pulses, i.e., mung bean (MB) and pigeon pea (PP), which are largely cultivated in Thailand, will be presented and discussed. A conventional wet extraction method through alkaline-acid precipitation process was used. The protein extracts are classified into the globulin-rich and albumin-rich fraction – the former is mainly a product from this type of extraction while the latter is normally regarded as side stream and less utilized. The results showed that the globulin extract had protein contents of 80.50 ± 0.19 and 76.12 ± 0.27% (w/w), while the albumin extracts had lower protein purities of 18.32 ± 0.23 and 43.81 ± 0.81% (w/w) for MB and PP, respectively. Both fractions exhibited good functionalities. Specifically, the albumins from both pulses showed higher solubility than those of the globulins. Their foaming properties were also higher than those of the globulins and even superior to those of egg white and whey proteins. The poorer foaming property of globulins is likely related to their aggregated structure, making them less efficient to create strong interfacial layer around air bubbles. On the other hand, the globulins showed better emulsion properties than those of the albumins, likely due to their higher surface hydrophobicity. The secondary structure of these protein fractions was prominently with higher β-sheets and lower random coil, α-helix, and β-turn. It is shown that the functional properties of plant proteins are directly linked to the protein refinement fractions. Such concept can allow us to control the functionality of these plant proteins which is viewed as a useful tool in assisting the food industry in developing more targeted and high quality plant-based food products.

KEYWORDS:
Pulse protein, extraction, functionality, globulin, albumin