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Title:

Bridging Protein Structure and Functionality: Highlighting Dispersibility as a Key Performance Indicator in Pea Proteins

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text into it.)

Preparation of Your Abstract

1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word **ONLY** (place names excluded). No full stop at the end.

2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

Introduction: Clearly state the purpose of the abstract

Methods: Describe your selection of observations or experimental subjects clearly

Results: Present your results in a logical sequence

Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

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Plant-based proteins often exhibit low solubility in food systems, limiting their applications. While the solubility of protein is often used for the characterization of proteins, most food systems are dispersions. Thus, evaluation of dispersibility of protein could be a complementary indicator of protein functionality.

Pea protein isolate (PPI) and concentrate (PPC) were lab-extracted and compared with commercial protein isolate and concentrate samples (CPPI, CPPC) across five pH values (3–7) and six concentrations (0.5–12%, w/v). All samples underwent compositional analysis, solubility, dispersibility, heat coagulation time (HCT), zeta potential, and particle size measurements. The dispersible and soluble phases were separated and evaluated for HCT, zeta potential, particle size, and SDS-PAGE.

Dispersibility consistently exceeded solubility across conditions and was more discriminative among samples, particularly at pH 3 and neutral pH (6–7). At 3% protein and pH 3, PPC showed 0.7 ± 0.1 g dispersible/g protein versus 0.3 ± 0.0 g soluble/g protein, while CPPI had the lowest values (0.1 ± 0.1 g and 0.1 ± 0.0 g/g, for dispersibility and solubility, respectively). As expected, the isoelectric region (pH 4–5) yielded the lowest values for both metrics due to protein aggregation. HCT revealed higher thermal stability at pH 3 and pH 7, reaching 10 and 20 min (PPC), or 6 and 30 min (PPI), respectively. At pH 6, HCT dropped to ~2.0 min, indicating reduced thermal resistance near the isoelectric region across all samples. SDS-PAGE confirmed that dispersible fractions retained a broader range of protein subunits compared to soluble fractions, with the soluble fraction consistently requiring longer times to coagulate.

Overall, dispersibility provided complementary insights to solubility, revealing distinct contributions to protein functionality. Processing approaches such as high pressure and ultrasound further improved dispersibility and heat coagulation time, particularly at the isoelectric pH. Considering both protein solubility and dispersibility may guide processing strategies to improve plant protein performance in complex food systems.