Extraction and processing shape the structural and emulsifying properties of pea proteins

Sarah Verkempinck [1], Lander Haesaert [1], Hannelore Tuyteleers [1], Daphne Michels [1], Tara Grauwet [1]

[1] Laboratory of Food Technology, Department of Microbial and Molecular Systems (M2S), KU Leuven, Kasteelpark Arenberg, 22, PB 2457, 3001 Leuven, Belgium.

sarah.verkempinck@kuleuven.be

The use of pea proteins in food systems is gaining attention due to their nutritional value and environmental benefits. Yet, the effects of extraction and processing conditions on protein structure and how these influence o/w emulsion stability are not yet well understood. This study investigated the impact of different extraction methods and processing steps (thermal treatment, drying techniques) on the structural and functional properties of pea proteins. A commercial pea protein isolate was used as a reference.

Extraction conditions were found to affect pea protein (micro)structure and emulsifying performance. Salt extraction and alkaline extraction at pH 7.5 yielded pea proteins with similar structural characteristics, whereas alkaline extraction at pH 11 resulted in greater denaturation and aggregation of the proteins. Despite this, pea proteins extracted at pH 11 formed emulsions with the smallest droplet sizes. The salt-extracted protein presented the best creaming stability. Drying methods had only a minor effect on pea protein structure. In contrast, thermal treatment had a more substantial impact, resulting in increased aggregation and emulsions with larger droplets and lower stability, independent of the extraction conditions.

These results demonstrate that processing-induced structural changes have a significant impact on pea protein functionality, particularly in o/w emulsions. Understanding the relationships between processing, structure, and function is crucial for developing high-performance plant-based food ingredients such as emulsifying agents.

Keywords:
emulsion stability, pea protein, plant-based ingredients, processing