

Developing thermally stable beverage emulsions using mildly fractionated pea proteins

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Abstract

The presence of insoluble components greatly minimizes the potential application of pulse proteins in beverage emulsions. Therefore, pea protein concentrate was mildly fractionated by aqueous centrifugation at 4,000g for 1 min to recover a soluble fraction (71% protein yield), which was then used to develop 5% oil-in-water emulsions using a high-pressure homogenizer. Emulsion stability was tested by heat treatment (90°C, 30 min) in the presence of NaCl (0-1M) at pH 7.0 and 2.0. Stability increased upon adding salt at pH 7, while at pH 2, proteins and droplets aggregated. Heat treatment led to extensive aggregation at both pH values due to denaturation and aggregation of proteins at the oil droplet surface, which was further worsened by salt. To prevent thermal destabilization, the proteins were heat-treated at 75°C for 30 min for partial denaturation before emulsification under hot conditions. The heat-treated protein-stabilized emulsions at pH 7 had superior thermal stability at all salt concentrations without aggregation. However, a similar improvement in stability was not observed at pH 2. Pre-heating the soluble protein exposed the hydrophobic patches, leading to better adsorption on the droplet surface, which did not show additional aggregation upon further heating the emulsions at pH 7. The heat-treated protein-stabilized emulsions showed about a 44% drop in lipid digestibility compared to the original emulsions. The proposed approach could be a valuable addition to the utilization of pea proteins in developing beverage emulsions that could withstand the heat treatment used during food processing.

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