**Functionalisation of pea protein by tryptic hydrolysis – characterisation of interfacial and functional properties**

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Aim of the present study was to improve the functional properties of pea protein, making it an attractive substitute for animal-derived food-ingredients and –additives in the context of nutritional recommendations. With respect to an application in dispersed systems (i.e. foams and emulsions) it is a prerequisite to improve the poor solubility of pea protein in the pH-range relevant to food (pH 5 to pH 7). It was hypothesised that enzymatic hydrolysis will improve solubility and positively affect the interfacial and functional properties of the protein.

Pea protein hydrolysate (PPH) with a degree of hydrolysis (DH) of 2, 4 and 6 % was enzymatically prepared from commercial pea protein isolate (PPI) using trypsin and applying the pH-stat method. For general characterisation the solubility, the isoelectric point, surface hydrophobicity and molecular weight distribution were determined. Emulsions containing 5 % oil and 1 % protein were prepared at pH 5 and 6 via high pressure homogenisation. Pressure and number of passes were varied. Emulsions were characterised through the oil droplet size distribution and visual assessment of changes in dispersity like aggregation, creaming and phase separation. Foaming experiments were carried out at a dynamic foam analyser with protein solutions of 0.25 % at pH 5, 6 and 7. The foam quality of PPI and PPHs was rated based on the foam stability over a period of 30 minutes. For further characterisation shear- and dilational experiments at the oil-water as well as at the air-water interface were carried out.

As a result of hydrolysis, a shift in the isoelectric point from pH 4.2 (PPI) to pH 3.3 (DH 6) occurred. In addition, surface hydrophobicity increased especially at pH 7. In combination with other aspects like e.g. reduction of molecular weight, these changes led to a significant improvement of solubility. At pH 5 the protein content left in the supernatant after centrifugation increased from 15 % (PPI) to approximately 60 % (DH 6). With PPI, no stable emulsions could be prepared at pH 5. At pH 6 the emulsions prepared from PPH showed a significantly reduced oil droplet size compared to pH 5 as indicated by the median of the oil droplet size distribution. An increase in pressure and/or the number of passes also significantly reduced the oil droplet size. All emulsions prepared with PPH were stable against coalescence. However depending on pH and DH different rates of flocculation and, as a consequence, creaming were observed. The stability against coalescence is supported by the rheological data. Data from both methods indicate that stable, viscoelastic films are formed at the oil-water interface. With respect to the air-water interface, only in dilational rheology interfacial films were formed in all samples. Foaming experiments showed a lower stability for the foams stabilised with PPH than for those with PPI.

In summary, hydrolysis improves protein solubility, which in turn affects technological functionality. Within the process range of the present study emulsifying properties were improved, whilst foaming properties were not positively affected.

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