

Correlation between pea protein fractionation and high moisture extrusion cooking behaviour.

LE FLEM G. (1), FAYOLLE f. (1), LAGORCE A. (1), JURY V. (1)

¹ ONIRIS-GEPEA, NANTES, France

The food transition from conventional animal proteins consumption to plant-based or unconventional proteins (algae, insects and pulses) is an essential societal challenge to feed the world's growing population. Plant-based proteins, extracted from sources such as peas, soy, lupin or wheat, can be used as functional ingredients. Recently, they have been used in high moisture extrusion cooking (HMEC) to create meat analogues. However, process used for the extraction of those proteins (dry or wet process) can lead to a denaturation of the primary structure and thus can affect their technical and functional properties.

The present contribution aims to study the impact of two pea protein raw materials obtained by dry and wet processes on fibrillation: a pea protein concentrate, obtained by the dry fractionation (PPC), and a pea protein isolate, obtained by isoelectric precipitation (PPI). The objectives are (i) to obtain a satisfactory meat analogue fibrillation with pea proteins and (ii) to measure the impact on texture according to the fractionation process. The functional properties of the two fractions were characterized.

Particle size measurement as well as fluidisation and flowability index were carried out on PPC and PPI. Then, protein and water content, sorption capacity, conductivity and solubility at different pH were also studied. Structural state was further investigated by micro differential scanning calorimetry and electrophoresis. After this characterization, extrusion of formulation containing PPC or PPI were studied using a Rheomex PTW 16/40 OS MK2 Thermo Fisher corotative twin-screw pilot extruder. Extrudates texture were finally analysed by traction/compression as well as dynamic mechanical analysis. Fibers of these samples were then observed at macroscopic scale.

The results show that PPI proteins are denatured and have a high aggregation rate, with a lower solubility than PPC. The particle size of PPI is however more suitable than PPC for HMEC process.

The main conclusion of this study is that the fibrillation capacity of pea proteins is correlated to their fractionation process.