

## Acid induced gelation of pea protein: impact of protein pre-treatment and post-fermentation processing on gel properties

Martina Klost<sup>a</sup>, Hamida Jacob<sup>a</sup>, Stephan Drusch<sup>a</sup>

*Technische Universität Berlin, Faculty III Process Sciences, Institute for Food Technology and Food Chemistry, Department of Food Technology and Food Material Science, Straße des 17. Juni 135, 10623 Berlin, Germany*

*martina.klost@tu-berlin.de*

Plant protein-based acid-induced gels, such as yogurt alternatives, are gaining increasing importance. However, while previous research has primarily focused on gelation behaviour and, to some extent, on the effects of formulation and pre-treatment conditions, the influence of shear during post-fermentation processing—either alone or in combination with pre-treatment effects—has not yet been investigated.

Therefore, the aim of our study was to investigate the combined effects of protein pre-treatment at different pH-values and post-fermentation shearing on the final gel properties of pea protein gels. To this purpose, pre-aggregation was performed at pH 6, 7, and 8 to obtain aggregates with different solubilities, and consequently gels with distinct initial rheological properties [1]. After gelation, the gels were subjected to a sequence of shear treatments designed to simulate different processing steps: stirring (10 min at  $1 \text{ s}^{-1}$ ), pumping (10 and 30 min at  $100 \text{ s}^{-1}$  and  $500 \text{ s}^{-1}$ ), and dispensing (1 min at  $800 \text{ s}^{-1}$  and  $1250 \text{ s}^{-1}$ ) [2]. Gel characterisation focused on the complex modulus  $|G^*|$  and loss factor  $\tan \delta$  before shearing, immediately after shearing, and after a resting period of 60 minutes, as well as on gel strength  $A$  and coordination number  $z$  measured before shearing and after resting.

Results showed a significant effect of pre-treatment pH on the rheological parameters throughout the process. More specifically, increasing the pH during pre-treatment resulted in increased complex modulus  $|G^*|$  and gel strength  $A$  after fermentation. Shearing as a whole decreased these parameters in all samples. However, no significant impact could be attributed to the specific variation of either shear rate or duration during the simulated stirring, pumping, or dispensing steps. Upon resting, partial restructuring of the gels occurred; however, the gel strength  $A$  remained markedly lower than before shearing in all samples. Interestingly, in samples pre-treated at pH 8, shearing followed by resting resulted in an increased loss factor  $\tan \delta$  and a decreased coordination number  $z$  compared to the original gel, whereas pre-treatment at pH 6 led to a slight increase in coordination number  $z$ . These observations indicate differences in shear-induced structural rearrangements depending on pre-treatment conditions and the initial gel structure.

### Keywords:

rheological properties, yoghurt alternative, pre-aggregation, gel structure, post-fermentation processing

### References:

- [1] M. Klost, C. Brzeski, S. Drusch, *Food Hydrocolloids* 2020, 108, 106036.
- [2] Y. S. Fangary, M. Barigou, J. P. K. Seville, *Food and Bioproducts Processing* 1999, 77, 33.