**Unravelling the structure of red lentil puree to trigger its use as a novel clean label ingredient in food applications**

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Abstract

In the past few years, the development of novel clean label food ingredients has been a concern of the food industry to address consumers awareness towards environmental and health issues. In this sense, red lentil flours have been used because of their high nutritional properties. But pulses functionality can also be modulated using simple processes such as cooking and grinding; in this presentation, we will show how we tried to unravel the macromolecular mechanisms behind red lentil puree to trigger its use as a novel ingredient.

In vegetable purees, the cell-wall particles and the serum phase both play a major role on texture 1,2. Red lentil puree was firstly fractionated in different types of particles (cell fragments, cotyledon single cells, and cell clusters), subsequently analyzed using optical microscopy and oscillatory measurements. Secondly, changes in texture and elasticity under influence of storage time (1 to 4 days), concentration (15, 20 and 25 wt%) and pH (6.5 and 4) were studied, by characterizing their serum phase composition and water mobility through low frequency nuclear magnetic resonance on hydrogen (H1-LF-NMR).

In the purees, single cells and cell clusters of high elasticity were key structural components, while cell fragments were stable upon dilution and helped to maintain the network. During cold storage, the purees became firmer and more elastic, and the proportion of soluble starch decreased, which was attributed to a retrogradation mechanism. The relative intensity of the peak with the highest relaxation time in H1-LF-NMR, usually representing syneresis, increased. The pH impacted the structure, as at pH 4, less proteins were soluble and firmness increased more drastically upon storage. Water mobility supported the hypothesis of tightened aggregation of macromolecules at pH 4, since the transversal relaxation time of the peak associated with bulk water mobility decreased.

Red lentil puree should be seen as a complex system with several levels of organization and multiple interactions, since different types of particles were embedded in a starch-protein matrix evolving with storage and pH. This opens up new perspectives about understanding the mechanisms behind complex food ingredients to generate innovative food products.

References

1 Colin-Henrion, M., Cuvelier, G., & Renard, C. M. G. C. (2007). Texture of pureed fruit and vegetable foods. Stewart Postharvest Review, 5, 1-14.

2 Moelants, K., Cardinaels, R., Jolie, R. P., Verrijssen, T. A., Van Buggenhout, S., Van Loey, A. M., ... & Hendrickx, M. E. (2014). Rheology of concentrated tomato-derived suspensions: effects of particle characteristics. Food and Bioprocess Technology, 7(1), 248-264.