**Emulsion gels enriched with β-glucan concentrate for reducing saturated fat in biscuits**

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Fat provides pleasant taste, desirable flavor and improved texture in baked products. However, margarine, widely used in biscuits, is inextricably linked to the increased risk of cardiovascular diseases due to the high content of saturated and trans-fatty acids, and therefore there is growing interest in innovative approaches to substitute it1. For this purpose, oil-in-water barley emulsion gels (BEGs) were formulated with varying ratios of barley flour containing ~27% w/w β-glucan/olive oil/water (from 13/10/77 to 31/30/39 w/w/w) at two different temperatures (25 and 60°C). A multi-instrumental analysis (rheometry, calorimetry, microscopy, chromatography) was employed for their characterization during storage (4°C for 7 days). Moreover, one emulsion gel formulation was used in biscuits as margarine replacer at 50, 70, 90 and 100% substitution level to compare the end-products with a full-fat biscuit (made with 30% margarine). Τhe textural characteristics of doughs and biscuits, following storage at different environments for 15 days, were evaluated using dynamic rheometry and texture analysis, respectively, as well as an *in vitro* enzymatic protocol was used for the evaluation of lipid digestion kinetics of the fortified biscuits. Mechanical spectra of BEGs showed a typical solid-like behavior for all preparations, with the elastic modulus being greater than the loss modulus over the entire frequency range. Additionally, penetration testing revealed that hardness and gel strength of BEGs largely increased upon storage, implying a strong time dependency of the gel network structure. The 31/30/39 BEG without heating exhibited significantly (p<0.05) higher values of apparent melting enthalpy (3.99 J/g barley flour) and temperature (72.48°C) of starch gelatinization than those of the 13/10/77 formulation (3.50 J/g and 64.87°C, respectively) at the end of storage. The values of rheological parameters (G’, G’’) for the control dough were greater than those of the formulated doughs enriched with BEGs preparations, whereas the Young’s modulus of freshly prepared biscuits, as measured by the three-point bend test, decreased with increasing level of fat replacement. Finally, the biscuits with higher levels of margarine substitution exhibited higher degrees of lipid digestion, which could be related to enhanced lipid emulsification caused by the increasing amounts of the barley β-glucan concentrate; nevertheless, the amount of total digested fat after 2 hours of digestion was still lower in the highly substituted samples compared to that of control due to the higher fat content of the latter.

References

1. Colla, K., Costanzo, A., & Gamlath, S. (2018). Fat replacers in baked food products. *Foods*, *7*(12), 192.