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Improving the nutritional quality of cookies using legume flours and substituting sugars and fat with specific semi-solid fiber syrup

M. Tagliasco¹, X. Suo², A. Baggio¹, O. Moreno Araiza², M. Moretton³, L. Bonfili², A.M. Eleuteri², E. Vittadini², N. Pellegrini¹

¹*Department of Agricultural, Food, Environmental and Animal Sciences, University of Udine, Udine, Italy*

²*School of Biosciences and Veterinary Medicine, University of Camerino, Camerino (MC), Italy*

³*Research and Innovation Centre, Fondazione Edmund Mach, San Michele all'Adige (TN), Italy*

Cookies are largely consumed worldwide. However, they are rich in free sugars and fat (saturated) and need to be reformulated to improve their nutritional value. In this study, a full factorial design was employed in cookies to investigate the effects of replacing wheat flour with chickpea or red lentil flours, partially substituting sugar with a fiber syrup (MELTEC®, M) and replacing butter with a fiber-rich (HI-FIBRE WF®, HF) structured oil in water emulsion, on their structural characteristics (texture) and in vitro protein and starch digestibility (INFOGEST protocol). Additionally, the in vivo glycemic index (GI) of the two-legume flour (chickpea and red lentil flour) cookies containing HF instead of butter and M to partially substitute sugars, was assessed and compared to a standard wheat flour cookie. Replacing butter with HF significantly increased cookies hardness. Red lentil cookies exhibited higher protein digestibility than those made with wheat or chickpeas. Moreover, the substitution of M and HF, alone or in combination, significantly enhanced the protein digestibility of legume-based cookies. In wheat cookies, only the combined substitution of butter with HF and sugar with M slightly increased protein digestibility compared to their control. Regarding starch, wheat cookies had higher digestibility than those made with legume flour, with no differences among legume cookies despite fat and sugar substitutions. For GI determination, 11 healthy volunteers were recruited and randomly consumed the 3 cookies. The results showed that the GI of all cookies can be classified as low (<55). Chickpea flour cookies exhibited a significantly lower GI compared to the wheat-based one thanks to the substitution of wheat flour with chickpeas flour (low in GI) and the inclusion of fiber-rich syrup partially replacing sugars and fully replacing butter. This study highlights the potential of ingredient substitution and legume flour to improve the nutritional profiles of cookies, offering healthier alternatives to conventional recipes. This project was funded by the European Union "NextGenerationEU".