

Processing and formulation modulate aroma, saponins and sensory profiles in pea-based cakes

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Legumes are receiving a huge momentum as interesting contributors to the food transition. Pea-based ingredients are increasingly used due to their interesting nutritional, functional and ecological characteristics. Yet the food industry is facing a challenge to introduce them into foods. This is due to several flavour compounds, inherent or induced by the process, which result in undesirable bitter taste and beany off-flavors. Despite the fact that from the sustainability standpoint the use of complete raw materials should be encouraged, there are still quality and nutrition issues for low-processed ingredients such as a higher presence of unpleasant odors, bitter and anti-nutritional compounds relatively to more refined ingredients such as protein isolates and starches. Therefore, this study aimed at understanding the impact of product processing and formulation on the fate of key aroma and taste compounds which are, in turn, linked to sensory perception.

For that purpose, different recipes of cakes were formulated by varying the composition of the pea ingredients (whole pea flour or its sub-fractions, starch and protein isolate) and the process parameters (beating time and baking temperature). The sensory properties of the cakes were characterized by descriptive quantitative analysis with 12 trained panellists. Chemical profiles of the main aroma compounds were analysed by HS-SPME/GC-MS and GC-Olfactometry to identify the changes in the key odour-active compounds. A kinetic approach was also carried on cakes to determine the fate of saponins during processing by an original method using HPLC-HRMS-ToF. Our results show the marked influence of formulation type and heat treatment on the sensory, volatiles and saponins profiles of the cakes. Longer beating times correlated with rancid, fatty and green odours and flavour perceived attributes, and enhanced lipid oxidation. More intense baking conditions led to the development of nutty and roasty notes and the decrease of the lipid oxidation notes. On the other side, the thermal degradation of saponins was also highlighted and quantified during baking. These results will be discussed in the light of chemical changes during processing and will provide insight into the links between sensory perception and flavour determinants which are key quality markers of these emerging ingredients.