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Gas chromatography: a useful tool for bakery products differentiation

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Bakery products (cookies, biscuits, cakes, crackers, bread and savoury snacks) are highly appreciated and frequently consumed by all age consumers, usually as part of breakfast, mid-morning and afternoon snacks.

The main ingredients of bakery products are: wheat flour, sugar, fat, water and salt.

With respect to fat, besides the total amount, it is very important to evaluate its quality, namely the fatty acid profile [1].

One of the most suitable technique to evaluate the fatty acids composition of a food is gas chromatography coupled to flame ionization detection [2].

The aim of this study was to evaluate if gas chromatography is a useful tool for bakery products differentiation, with respect to their fatty acids profile and impact on human nutrition.

In Figure 1, examples of chromatograms for samples SWB2 and SWB3 are shown.

Most of the analysed foods (83%) have a higher content of saturated than monounsaturated and polyunsaturated fatty acids (Figure 2).

For all the studied categories considerable differences were observed in the fatty acid profile, except for brioche with chocolate chips.

In "Maria" cookies, plain salty cookies and coated chocolate cookies, at least one sample had as major fatty acids the monounsaturated instead of saturated.

In the brioche filled with chocolate category, for two of the analysed samples the major fatty acids were saturated, while for the other sample polyunsaturated fatty acids were predominant.

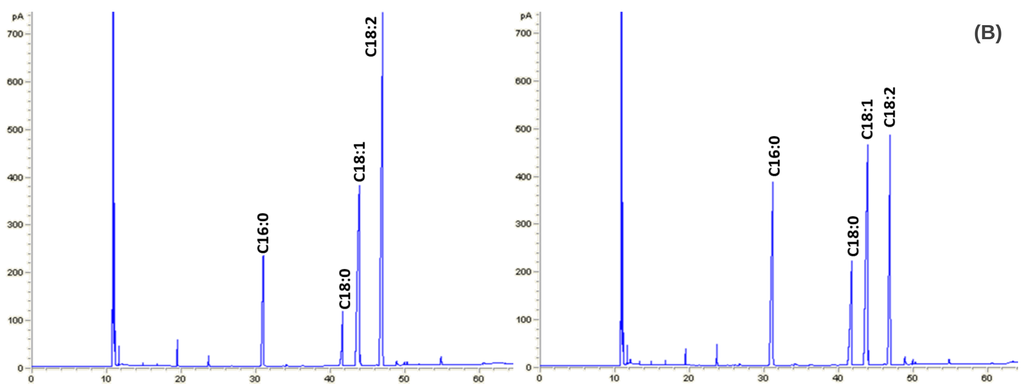

Figure 1. Example of chromatograms of the major fatty acids for two samples of brioche filled with chocolate ((A) sample SWB2 and (B) sample SWB3). C16:0, palmitic acid; C18:0, stearic acid: C18:1, oleic acid; and C18:2, linoleic acids.

Sampling

Between 2015 and 2016, 30 bakery products from different brands were acquired in supermarkets from Lisbon region. Upon reception at the laboratory, samples were homogenized in a blender at 5000 rpm during 1 min, to obtain composites from each sample.

Samples were grouped into the following categories: "Maria" cookies, plain salty cookies, coated chocolate cookies, brioche filled with chocolate, brioche without filling and with chocolate chips, and French croissants.

Total fat

Total fat determination was performed using an acid hydrolysis followed by Soxhlet extraction with petroleum ether 40 – 60º. The obtained residue was dried for 1 h 30 min at 101 °C ± 2 °C, until constant weight [3].

Fatty acids

Fatty acids transesterification was performed with a methanolic solution of potassium hydroxide and n-heptane. Afterwards, samples were analysed using a gas chromatograph equipped with a flame ionization detector [4].

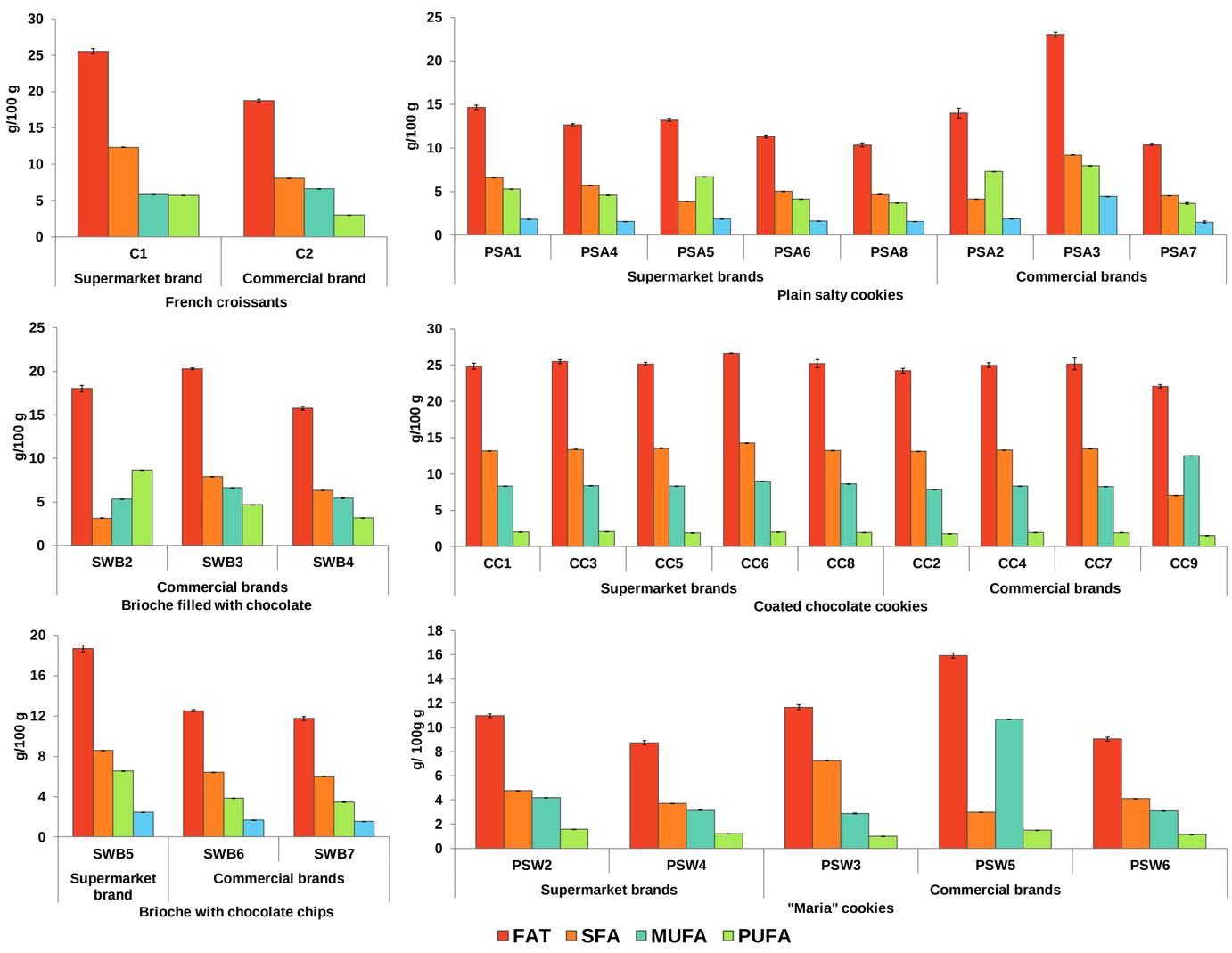

Figure 2. Comparison of the fat content and fatty acids composition of commercial and supermarket brands for different groups of bakery products (Different numbers represent different brands for similar products; PSW, plain sweet cookies; SWB, sweet breads; PSA, plain salty cookies; CC, Coated cookies; C, croissants; SFA, saturated fatty acids; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids).

In conclusion, gas chromatography is a useful technique to differentiate the nutritional quality of bakery products, as well as to estimate the potential impact of these foods on public health. Furthermore, it was possible to conclude that food industry should address new strategies to reformulate their products. According to the obtained results, it is possible to produce similar foods with healthier nutritional features.

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