BOOK OF ABSTRACTS

11th International Symposium on
RECENT ADVANCES IN FOOD ANALYSIS

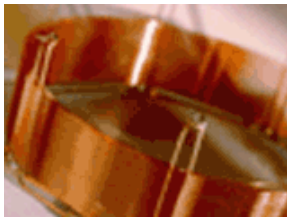
November 5–8, 2024

Prague, Czech Republic

Jana Pulkrabová, Monika Tomaniová, Stefan van Leeuwen, Michele Suman, Michel Nielen and Jana Hajšlová

Editors



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K13
CHARACTERIZATION OF PLANT-BASED BEVERAGES BY 1D, 2D, AND QUANTITATIVE NMR

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Plant-based beverages (PBBs) are defined as emulsions obtained from different plant materials like legumes, cereals, pseudo-cereals, seeds, or nuts after the main steps of soaking, filtration, and thermal treatment. Naturally, they represent lactose-free options ideal for consumers with allergies or intolerance, and they possess environmental advantages compared to bovine milk, since the CO_2 fingerprint for their production is lower, their fiber content, and they favor animal welfare. They are also a staple food for those consumers that opt for new dietary habits such as veganism, vegetarianism, and flexitarianism [1,2]. In the last decade, efforts have been directed mostly towards their nutritional composition (in terms of macro and micronutrients), production processes, anti-nutritional factors (tannins, saponins, and enzyme inhibitors), their sensory acceptability, their protein availability, and the diversity of aroma-related compounds [1,3]. However, there is a large literature gap in the use of 1D, 2D NMR, and qNMR in the characterization of PBBs to gain deeper knowledge about their composition. The objective of this work was to characterize the polar extract of soy, oat, and almond PBBs by ^{1}H NMR, HSQC, and qNMR using sucrose as an external standard, with cow milk as a reference matrix. The analysis by ^{1}H NMR revealed that that the reference matrix was the one with the highest number of found compounds (68). The main chemical families were nitrogen compounds (excluding amino acids), carbohydrates, fatty acids, and organic acids. Then, soy PBB was the one closest to the reference in number of found and identified compounds, sharing fatty acids and carbohydrate signals but with distinct compounds like nucleosides, taurine, histidine, and histamine. Oat and almond PBBs showed around 30% less compounds (48 and 42, respectively) compared to the reference. Oat PBBs showed a richer carbohydrate profile with presence of mono, di, and oligosaccharides, especially maltose and raffinose. Almond PBB was the one with the lowest number of compounds among the 4 matrices, with pantothenate and *myo*-inositol as distinctive compounds. A total of 33 compounds were quantified, an analysis of variance with Tukey *post-hoc* test showed higher concentration of most organic acids and choline and its derivatives in cow milk. Soy PBB was enriched in compounds like stigmasterol and glucose-1-P, while oat PBB in beta-maltose, trigonelline, and valine. Finally, almond PBB showed significantly higher concentrations of tartrate, galacturonate, and malate. NMR and qNMR served as a fast and efficient tool for the characterization of plant-based beverages, bringing new knowledge about their composition to consumers and producers, and allowing the future proposal of authenticity and quality markers of these matrices after different production processes like incorporation into other matrices or fermentation.

Keywords: plant-based foods, food quality, nutrition, food composition, nuclear magnetic resonance

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