DETECTION OF ADDITION OF FATS NON-DAIRY ORIGIN INTO MILK PRODUCTS

Nicoleta CHIRA[1*], ORCID ID: 0000-0002-7786-5649
Mihaela TOCIU[1], ORCID ID: 0000-0002-8606-5555
Liliana POPESCU[2], ORCID ID: 0000-0003-3381-7511
Mihaela IVANOVA[3], ORCID ID: 0000-0002-6041-8471
Aurelia BRATU[1], ORCID ID: 0000-0002-7551-5178
Mihaela MIHALACHE[1], ORCID ID: 0000-0002-5428-3099
Calin DELEANU[4], ORCID ID: 0000-0001-8206-5227

[1]*Univ. "Politehnica" of Bucharest, "C. Nenitescu" Organic Chemistry Department, Bucharest, Romania*
[2]*Technical Univ. of Moldova, Department of Food Technology, Chisinau, Republic of Moldova*
[3]*Univ. of Food Technologies-Plovdiv, Technology of Milk and Dairy Products Department, Plovdiv, Bulgaria*
[4]*Center of Organic Chemistry "C.D. Nenitescu" of the Romanian Academy, Bucharest, Romania*

*Corresponding author: Nicoleta Chira, *nicoleta.chira@chimie.upb.ro*

Introduction: This work deals with the detection of adulteration of dairy products, which in some countries (especially the developing countries) is seen as a serious issue. Possible adulterants for milk fat (MF) are waste oils from both vegetal (sunflower, soybean, rapeseed) and animal (lard, beef/sheep tallow, chicken fat) origin.

MF contrasts with other fats and oils by its short (C4-C6) and medium (C8-C12) chain fatty acids composition. The standard method to accurately determine of the fatty acids profile (FAP) of milk and dairy products is gas-chromatography (GC), which requires the methylation of the fatty acids to the corresponding methyl esters, prior to their chromatographic separation. As a result, the GC method is laborious and time-consuming, given the chromatographic separation step is also long (approximately 1 hour). Consequently, faster alternative methods are welcome. [1]

Materials and methods: Three descriptors of conformity/adulteration were determined for each sample, based on the ^{1}H-NMR data (in particular, based on the integral values of resonances associated with chain length, unsaturation, and butyric moiety). Each fat sample was consequently characterized by three numerical values, corresponding to the descriptors.

Results: Cartesian 3D representation of samples revealed their clustering according to fat type, leading to good classification. Adulterated samples placed outside the groups, as outliers.

Conclusions: The classification model according to the ^{1}H-NMR based descriptors allows visualization of adulterated samples.

Keywords: *butyric acid, adulteration, milk fat, ^{1}H-NMR descriptors, 3D data visualization.*

Acknowledgments. This work has been funded through international grant "Méthode rapide basée sur la spectroscopie de ^{1}H-RMN pour déceler les fromages adultérés par addition de graisses végétales (FRAUDmage)", code AUF-ECO_SRI_2021_FRAUDmage_2144-2638, financed by Agence Universitaire de la Francophonie (AUF) and co-funded by the University POLITEHNICA of Bucharest (Bucharest, Romania), the Technical University of Moldova (Chişinău, Republic of Moldova) and the University of Food Technologies (Plovdiv, Bulgaria).

References

1. Chira N.A., Todasca M.C., Nicolescu A., Rosu A., Nicolae M., Rosca S.I. Evaluation of the Computational Methods for Determining Vegetable Oils Composition using ^{1}H-NMR Spectroscopy. Rev. Chim. **2011**, 62 (1):42-6.