

VERIFICATION OF MILK ON THE SLOVENIAN MARKET BASED ON STABLE ISOTOPE AND ELEMENTAL ANALYSIS

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Compliance with legal and labelling requirements, determination of nutrient values and detection of adulteration are some of the main reasons for the development and application of methods and techniques in food science. In this presentation, stable isotope ratios of light elements ($^{13}\text{C}/^{12}\text{C}$, $^{15}\text{N}/^{14}\text{N}$, $^{18}\text{O}/^{16}\text{O}$, $^{34}\text{S}/^{32}\text{S}$) and elemental composition were used to verify the correct assignment of Slovenian milk samples and to develop a discrimination model able to discriminate between milk of Europe and Slovene origin.

The first database of authentic Slovenian cow milk has now been established and includes isotopic composition of oxygen ($\delta^{18}\text{O}$) in milk, the isotopic composition of carbon, nitrogen and sulphur in casein ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$) and the elemental composition of raw milk. Samples were collected in summer and winter during 2012, 2013 and 2014 from different geographical regions (Alpine, Dinaric, Pannonian, Mediterranean) in Slovenia.

By applying Linear Discriminant Analysis (LDA) to the data set of authentic Slovenian samples in 2013 and 2014, it was possible to differentiate Slovenian milk from milk produced in other EU countries (Austria, Croatia, Germany, Italy). The most important parameters that contributed to F1 distinctiveness were $\delta^{18}\text{O}$, Sr, K, Ca, while F2 was characterized by $\delta^{13}\text{C}$ in casein, Zn, Br and $\delta^{18}\text{O}$. Furthermore, eleven milk samples, labelled as “Slovenian milk” were confirmed and classified as being authentic Slovenian milk. Results indicated that LDA classification could effectively contribute towards distinguishing milk samples of different geographical origin and provide a useful tool for the inspection and verification of declaration of origin. Information available through our study could be used to increase the transparency of the milk and dairy products supply chain.

This research represents a part of the ERA Chair ISO-FOOD for isotope techniques in food quality, safety and traceability.