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Control of Mozzarella di Bufala PDO cheese authenticity through stable isotope and multielement composition analysis

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Mozzarella di Bufala Campana (MBC) is an Italian protected designation of origin (PDO) cheese produced particularly in Campania in the province of Caserta and Salerno, and to some extent in other Italian regions: Lazio, Puglia and Molise. It is a pasta filata cheese product made from whole buffalo milk and an acid whey starter.

High consumer demand for this cheese, the limited amount of buffalo milk available and the high market price make this cheese a remunerative target for either adulterated or false PDO sales.

Consequently, it is necessary to develop rapid and accurate methods to verify its authenticity and protect both consumers and honest producers.

Stable isotope ratio analysis of bioelements ($^2\text{H}/^1\text{H}$, $^{13}\text{C}/^{12}\text{C}$, $^{15}\text{N}/^{14}\text{N}$, $^{18}\text{O}/^{16}\text{O}$, $^{34}\text{S}/^{32}\text{S}$) using Isotope Ratio Mass Spectrometry (IRMS), combined with trace element analysis (Li, Na, Mn, Fe, Cu, Se, Rb, Sr, Mo, Ba, Re, Bi, U) using Inductively Coupled Plasma– Mass Spectrometry (ICP-MS), is one of the most powerful techniques for detecting the authenticity of PDO cheeses.

In this work, we present the mineral and isotopic profile of 76 authentic samples of buffalo milk and the corresponding MBC samples. Initial evaluation has highlighted the importance of the $\delta^{18}\text{O}$ and $\delta^2\text{H}$ values of casein, as well as of Rb content for tracing the origin of these products.

In order to have an overall picture of the market we also investigated the authenticity of 20 PDO samples and as a comparison, 10 non-PDO products.

Keywords: traceability, Mozzarella di Bufala Campana PDO, ICP-MS, IRMS