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TRACING THE IDENTITY OF MOUNTAIN PRODUCT PARMIGIANO REGGIANO PDO CHEESE USING ^{1}H-NMR SPECTROSCOPY AND MULTIVARIATE DATA ANALYSIS

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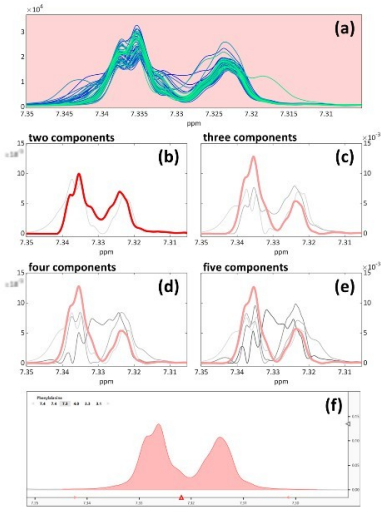
Parmigiano Reggiano cheese is one of the most appreciated and famous Italian cheeses and even if its name is usually associated with a single product idea, different varieties can be found. In particular, the product "Prodotto di Montagna - Progetto Qualità Consorzio ("Mountain Product - Consortium Quality Project") represents a quality denomination for Parmigiano Reggiano PDO (Protected Designation of Origin) cheese that must comply with rather strict rules about its aging, geographical origin and the cow feed and breeding.

In this scenario, there has been an increasing request from both dairy farmers and consortia to protect the authenticity of Mountain Product Parmigiano Reggiano PDO from analogues, and to promote it as a higher quality product. To this aim, comprehensive analytical techniques can provide objective quality and identity assessments and proton nuclear magnetic resonance (^{1}H-NMR) spectroscopy can be used as a tool for metabolic fingerprinting of milk and its derivatives [1-2]. NMR spectroscopy can provide huge amounts of information directly related to many metabolites with a single analytical run, and it can be therefore used for the identification of sugars, small organic acids, vitamins, nucleotides, and aromatic compounds. Due to the NMR signals complexity, multivariate data analysis is needed to interpret and extract information from this type of data, generally leading to optimal results in food characterization and authenticity assessments [3–4].



In this study the metabolic profile of "Mountain Product - Consortium Quality Project" and conventional Parmigiano Reggiano PDO samples were analyzed by means of ^{1}H-NMR spectroscopy, with the aim of finding information useful to distinguish the two denominations. To this aim, two different data analysis approaches were employed: the full spectra dataset (i.e., without any compression) was compared with a "features dataset" obtained by applying Multivariate Curve Resolution (MCR, [5]) to carefully defined small intervals. The extracted features were compared and matched with literature and reference libraries to obtain a putative identification of the resolved compounds/metabolites.

Figure 1 – Chemical identification of MCR-resolved components (b–e) by comparison with a reference library (f).

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