DISCRIMINATION BETWEEN SLOVENIAN COW, GOAT, AND SHEEP MILK AND CHEESE BASED ON ELEMENTAL AND STABLE ISOTOPE COMPOSITION

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Due to increased consumer requirements and quality expectations, there exist an increasing interest in demand for high quality dairy products with clear geographical origin, such as product with a Protected Denomination of Origin (PDO) or protect geographical indication (PGI). The consumption of dairy product is steadily increasing in recent years, rendering the proof of provenance a vital issue in food and consumer protection. The Protected Designation of Origin (PDO) trademark has been assigned to numerous local products based strictly on their area of origin, while PGI covering dairy products has at least one said stage that takes place in a certain area.

Our study includes a combination of elemental and stable isotope analysis of milk and cheese from cow, goat and sheep provided from several farms from different regions of Slovenia to identify the patterns that allow us to distinguish among cow, goat and sheep milk and cheese and to discriminate milk and cheese according to their region of production.

SAMPLING

Milk samples:  
- 76 samples of cow milk form Alpine, Dinaric, Pannonian and Mediterranean  
- 11 samples of goat milk and 35 samples of sheep milk from Bovec (Alpine), Karst, Vipava, Brkini (Mediterranean), central Slovenian region (Dinaric)  
- 7 samples with mixed origin: sheep-goat-cow (1 sample), sheep-goat (2 samples), sheep-cow (2 samples) and goat-cow (2 samples)

Cheese samples:  
- 15 samples of sheep cheese  
- 6 samples of goat cheese  
- 9 samples of cow cheese

Two types of cheese have EU PDO status: Bovški sheep cheese (Bovški ovčji sir) and cow cheese (Tolminc) and one local PDO status Kráški sheep cheese (Kráški ovčji sir).

ANALYTICAL METHOD

Stable isotope analysis
- determination of δ13O in milk with IsoPrime MultiFlow Bio
- determination of δ13C, δ15N, δ34S in casein with IsoPrime 100 – Vario PRO Cube (OHCNS)

Elemental analysis
- determination of macro- and micro-elements (P, S, Cl, K, Ca, Zn, Br, Rh, Sr) on a freeze-dried samples by X-ray fluorescence spectrometry (XRF)

Statistical analysis
- calculations and multivariate analysis were carried out using the XLSTAT software package (Addinsoft, New York, USA).

CONCLUSION

The first systematic characterization of authentic Slovenian cow, sheep and goat milk and cheese were defined using a combination of different isotopic ratios of major bioelements (δ13C/δ15N, δ34S, δ34S/δ34S) and elemental composition. This preliminary study highlights the most important parameters, which in DA classification differentiate milk and cheese according to animal species and geographical origin and can contribute towards supporting the existence of a Protected Designation of Origin (PDO). PDO products are important for the promotion of the local products and in addition to the contribution to local economy, they contribute to the promotion of the culture of the given community as well.

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