PRELIMINARY RESEARCH ON THE USE OF SHEEP'S CHEESE AS A SOURCE OF MINERAL ELEMENTS

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Abstract

Milk and dairy products represent valuable nutritional foods, which bring many benefits to the health of the human body. The nutritional quality of sheep's cheese is given by nature as well by the content of essential mineral elements that enter into its composition. Therefore, the evaluation of the nutritional quality, of the sheep's cheese mineral intake is conditioned by knowing the concentrations of the mineral elements that are part of this food. The aim of the paper is to determine the concentrations of some essential mineral macro- and microelements: Ca and Mg, respectively: Fe, Zn and Cu from sheep's cheese and to evaluate the mineral intake of this food product in the recommended daily diet. The sheep's cheese taken in the experiment is well represented in terms of the content of: Ca, Mg, Fe, Zn and Cu, essential mineral elements with a beneficial effect on the body. In the analyzed sheep's cheese were identified high amounts of calcium (4892±275 mg/kg) and magnesium (443±38.64 mg/kg), significant amounts of Zn (22.14±1.52 mg/kg) and Fe (9.78±1.29 mg/kg) and appreciable amounts of Cu (1.07±0.17 mg/kg). The mineral profile of this nutritional food shows the following decreasing trend: Ca>> Mg>> Zn >Fe >> Cu.

Introduction

Worldwide, cheese has become a major agricultural product. exceeding the annual production of coffee beans, cocoa, tea or tobacco. Currently, cheese can be obtained from sheep, cow, but also goat or buffalo milk. It serves as one of the good sources of essential nutrients such as proteins, lipids, minerals and vitamins [1,2]. Cheeses can be classified according to several criteria, such as: manufacturing process or country of origin, fat content, type of milk used and the animal from which it is obtained, and the consistency of the varieties . It is a functional food with an important weight in the human diet, being a rich source of essential nutrients such as: proteins, carbohydrates, amino acids, fats, fatty acids, vitamins and essential minerals [3,4]. The type of milk used is very important for the quality of the cheese. The sheep milk is a valuable product with high nutritional value compared to the milk of other domestic species being used mainly for the cheese production [5]. Due to its protein content with high biological value, Telemea cheese is of great nutritional importance. The special characteristics of the cheese are given by the significant amount of minerals, beneficial to human nutrition, such as calcium, magnesium, phosphorus, potassium and sodium. The sheep cheese is part of the category of traditional white brined cheeses from East-Mediterranean countries produced in all countries of the region under various names: Feta,Telemes(Greece); Telemea/Braila cheese

(Romania); Bjalo salamureno sirene/Bjalo sirene (Bulgaria); Bieno sirenje (FYROM); Mohant (Slovenia); Sjenicki, Homoljski, Zlatarski, Svrljiški (Serbia); Pljevaljski, Polimsko-Vasojevaski, Ulcinjski (Montenegro); Travnicki/Vlasicki (Bosnia-Herzegovina); Beyaz peynir, Edirne peyniri (Turkey); Liqvan, Iranian white (Iran); Brinza (Israel); Akawi (Lebanon); Domiati, Mish (Egypt) [8].

Experimental

Sheep's cheese contains important amounts of essential mineral elements, unevenly distributed according to a number of factors including: the origin of the milk used to obtain the cheese, processing and packaging techniques, etc. For this reason, knowing the distribution of these essential mineral elements is very important for assessing the quality of this food product. To achieve the proposed goal, three samples of different salted sheep's cheese (in brine), were purchased, from three agro-food markets in Timişoara, which originated from local producers of the Banat plain area. For each collection point, were taken 500g of local sheep's cheese prepared in the months of May - June of 2023 which (after homogenization) constituted the basis for the preparation of the samples taken for the analysis. The results obtained from the analysis of these average samples were noted in the present paper, according to the place of collection, as: sample A, sample B, sample C. Concentrations of Ca, Mg, Zn, Fe and Cu from sheep cheese samples were determined by atomic absorption spectrometry in the air-acetylene flame. The concentration of the mineral elements in the cheese samples taken in the experiment was achieved by the acetylene flame atomic absorption spectrometry method, following a protocol described by Gogoasa *et al*. [7]. This protocol involves the mineralization of cheese samples through calcination, followed by the solubilisation of ashes in acid HNO_3 0.5 N and measuring the absorbance of mineral elements in the acid solution. The device used was atomic absorption spectrophotometer in air flame - acetylene, brand Varian AA 240 FS, a laboratory water bath and a thermal regulation electric stove. Also, the reagents used are Nitric acid Merck, 65% (ρ = 1.39 g/cm3) to prepare the nitric acid solution 0.5 N; standard solutions for the analyzed elements: Ca, Mg, Fe, Mn, Zn and Cu, obtained from the concentrated standard solution Merck Darmstadt - Germany, 1.000g/ml. The total concentration of analysed microelements was determined by the relationship:

$$C\ [mg/kg] = \frac{a \cdot 50}{m}$$

where: a – element concentration read of the device(mg/l); m –sample mass (g) taken into study

Results and discussion

The experimental results obtained from the analysis of the mineral elements in the sheep cheese samples taken in the experiment are presented in the table 1

Table 1

Total concentration of Ca, Mg, Zn, Fe and Cu in sheep cheese

Specification	Mineral content, mg/kg of raw product				
	Ca	Mg	Zn	Fe	Cu
Sample A	4835	496	20.17	8.46	0.86
Sample B	5254	405	22.36	9.51	1.28
Sample C	4588	428	23.88	11.37	1.10
Average values	***4892±275***	***443±38.64***	***22.14±1.52***	***9.78±1.29***	***1.07±0.17***

As can be seen from Table 1, the distribution of Ca, Mg, Fe, Zn and Cu in sheep cheese analysed samples is non-uniform, being dependent on the origin of the sample and on the nature of the analysed element. The concentration of these elements varies between 0.86 mg/kg Cu - 5254 mg/kg Ca. The best represented among the analyzed elements are the macroelements: Ca (4892±275 mg/kg) and Mg (443±38.64mg/kg). Microelements were identified in much lower concentrations, their average concentrations being: 22.14±1.52 mg/kg Zn, 9.78±1.29 mg/kg Fe and 1.07±0.17 mg/kg Cu. The mineral profile of sheep's cheese shows the following decreasing trend: Ca>> Mg>> Zn >Fe >> Cu. Calcium, essential macroelement, indispensable for the development of the bone system in childhood and adolescence, but also for the maintenance of bone health throughout life.

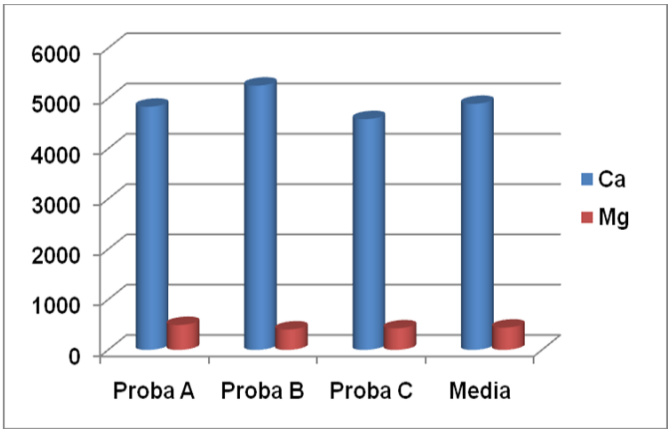

Figure 1. Distribution of Ca and Mg in sheep cheese

Calcium, an essential macroelement, is the best represented among the analyzed elements, the average concentration of this macroelement being 4892±275 mg/kg. Magnesium, an essential macroelement, was identified in much lower concentrations than Ca, but much higher than the microelements: Zn, Fe and Cu. The average concentration of Mg is 443±38.64 mg/kg.

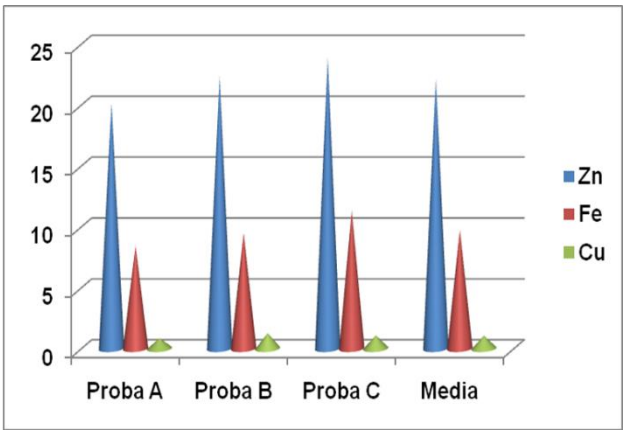

Figure 2. Distribution of Zn, Fe and Cu in sheep cheese

Zinc, an essential microelement, was identified in much lower concentrations than Ca and Mg, but higher than Fe and much higher than Cu. This is the best represented among microelements, its concentration limits being between 20.17 - 23.88 mg/kg. Iron, an essential trace element, was determined in concentrations between 8.46 -11.37 mg/kg. The average Fe concentration

(9.78±1.29 mg/kg) is much lower than Ca and Mg concentrations, lower than Zn concentration and higher than Cu concentration. Copper, an essential microelement, was determined in the lowest concentrations among the elements analyzed (1.07±0.17 mg/kg).

Conclusion

Due to the supply of vitamins (A, D, E, K) and minerals (Ca, P, Mg), fatty acids (FA), cheeses are a basic food that the body needs to function normally. The sheep's cheese taken in the experiment is well represented in terms of the content of: Ca, Mg, Fe, Zn and Cu, essential mineral elements with a beneficial effect on the body. Increased amounts of calcium and magnesium, significant amounts of Zn and appreciable amounts of Cu were identified in the analyzed sheep's cheese. The distribution of mineral elements in the analyzed sheep's cheese shows unevenness, their average concentrations having the following values: 4892±275 mg/kg Ca, 443±38.64mg/kg Mg, 22.14±1.52/kg Zn, 9.78±1.29 mg/kg Fe and 1.07±0.17mg/kg Cu. The mineral profile of this food shows the following decreasing trend: Ca>> Mg>> Zn >Fe >> Cu. In the conditions of the present study, it can be stated that the analyzed sheep's cheese can be considered as a mineralizing food, especially from the point of view of the content of Ca, Zn, and Mg.

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