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Study on some characteristics of fresh cheese with selenium

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Abstract
Being known the selenium request for human, in the conditions of a severe carence of selenium in Romania [1, 2], the aim of this paper was to propose a new product for romanian market – fresh cheese with selenium, as „functional food" (this term does not exist in romanian legislation, the sinonim of this is „food reached with..."). It is well-known in the specialized literature the enrichment with good results of animal origin food with Se [3, 4, 5, 6]. In the majority of cases they proceeded to the enrichment of fooder with Se, finally obtaining enriched animal products (milk, eggs, meat). We added various doses of selenium in the primary matter (cow milk) used to obtain fresh cheese, strictly following the specifical technological stages of cheese manufactoring. We made several requested tests in order to homologate and launch this product on the romanian market. We efectuated only some of the tests for this purpose, not all tests. Until now we determined: acidity, pH, humidity, fats, major of mineral elements from cheese and from whey. The „fresh cheese with selenium" presented sensorial (didn't remark major differences between basic product and the product with selenium, excepting smell) and physical-chemical characteristics similar with the product without selenium, the analized products framed within the legal limits of romanian commercial legislation. It was remarked a higher acidity of cheese samples with selenium supplement but not in whey samples.

Keywords: cheese, selenium

1. Introduction

Selenium is the major component of glutatione-peroxidase enzyme. It is an antioxidant microelement and may be anticancerigen. In human body the esential selenium role resides in cell breathing, in hemoglobin protect, and in favour of vitamine E absorbtion and in growing of vitamine E efficiency. Selenium is known as antiaterogene and antiageing. This element contributes to mentaining of tissues elasticity, diminish specifical symptoms of menopause, helps in the cardiovascular treatment and to reproduction processes [7].

From the experimental point of view, the enrichment of the food with selenium prooved to be very positive, being observed the reducing of somatical cells in the milk [6]; the decrease of incidence and severity for clinical mastitis [8]; the decrease for number of cases from retained placenta [9]; the improvement of reproduction parameters [10].

Although the daily recommended doses for microelements in the human and animal food are evidently small, however their importance - in zootechnical production for instance - is well documented. By fortune, the difference between defficiency and toxicity is enough significant in order to be handled. This issue allows a lot of adds

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administration practices to be implemented without major problems.

Like any other microelement, selenium is necesar to sustain life and also essential for basic physiological functions. On the other hand, selenium was identified as toxic mineral before being recognized as an essential element. In 1957 selenium was irrevocably defined as microelement essential in nutrition, when a german chemist demonstrated that hepatic necroses on rats fed with beer yeast sedimentary could be prevented by simply adding of selenium in the same yeast [11].

This was the beginning of a long battle for the the validation of selenium as fooder aditif – in the conditions of a thin border between carency and toxicity, combined with the suspision that selenium can be a toxic agent for the environment. These hesitation brought more 30 years lost in debates, supplementary research and political confrontations before the validation by FDA of 0,3 ppm selenium doses in the complete fodders for the majority of animals in zootehnical farms.

Through analogy, in human, selenium is also necesary like in the animals. An increasing number of prooves indicate that selenium is very important for human health. In human, the simptoms of selenium carency may be: high cholesterol level, slow growing and development, frequent infections, reduced hepatic functions, masculine sterility etc. [12].

The selenium level in food depends to the natural differences between the essential foods and selenium availability in environment, availabilty which can influenced by human activities.

A great number of works reported values of selenium content in food. Some examples of these are presented below (as mg/kg):

- 0.4 to 1.5 in liver, kidney and seafood;
- 0.1 to 0.4 in muscles;
- 0.1 to 0.8 in cereals and cereal products;
- 0.1 to 0.3 dairy products;
- 0.1 in fruits and vegetables (Oelschlager şi Menke, 1969; Morris şi Levander, 1970; Schroeder şi col., 1970; Suchkov, 1971; Arthur, 1972; Millar şi Sheppard, 1972; Ferretti şi Levander, 1974; Sakurai şi Tsuchiya, 1975; Abutalybov şi col., 1976; Bieri şi Ahmad, 1976; Kasimov şi col.., 1976; Olson şi col., 1978, quoted by [3].

These values vary from a country to another, partially because they may be influenced by analytical methods and the procedures of preparing the samples [3].

Organs like kidney and liver contain the highest selenium level, but seafood is also rich in selenium, approaching to the same levels. Muscles are significant sources for selenium, although they do not approach to the same selenium levels like in muscles or seafood.

Certainly, the cereal products may improve significantly the selenium presence in the food ratio.

Milk, cheese and eggs have a lower content of selenium but the reported results vary in large limits, because the food is produced and provided by different countries [3].

Fruits and vegetables, generally, contain lower levels of selenium, for all that mushroom and garlic present moderate selenium contents.

2. Materials and method

Our product was obtained with clasic methods, in “homemade” conditions, from non-pasteurized milk. This milk was produced in a village area and supplemented with selenium from Pharmasel. Supplementation doses were different: 50, 37.5, 25 şi 12.5 μg Se/L milk. The selenium adding was implemented in coagulation phase of milk. Each selenium tablet contained 50 μg Se, 100 mg C vitamine and 20 mg E vitamine. This association of Se with E and C vitamins is very benefical, because they are in a sinergism relation [1, 2, 5].

First, we mention that Se recomended dose for an adult is between 50 and 200 μg Se/day. The highest supplement dose of Se was established at minimum recommended

dose, on the reason that a consummer may ingest also Se from a higher quantity of cheese or from other sources, and the outrun of the maximum dose can be toxic.

The product obtained in according with the technological scheme was sensorial examinated in comparison with the product from control sample.

The determinations made until now at the our proposed product were:

- cheese and whey acidity determination - by Torner method [13, 14, 15]
- pH determination of the cheese and whey – by potentiometric method [16];
- mineral content determination from cheese and whey – by spectroscopy method;

humidity determination – by etuve drying [16].

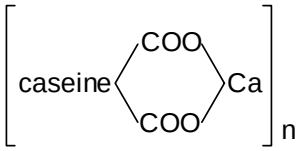
3. Results and discussion

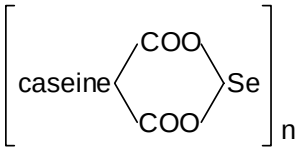
After the determinations made for whey and cheese with selenium, we obtained the results presented in table 1. This value are the mean between three simultaneous determinations.

Table 1. Some phisico-chemical parameters of the whey and the cheese with selenium

		P0 (0 μg Se/L milk)	P1 (12.5 μg Se/L milk)	P2 (25 μg Se/L milk)	P3 (37.5 μg Se/L milk)	P4 (50 μg Se/L milk)
Acidity °T	Cheese	40.6	46.0	48.3	48. 5	50.2
	Whey	48.5	53.0	52.5	52.0	52.3
pH	Cheese	5.5	5.0	5.1	5.1	5.0
	Whey	4.5	3.9	3.6	3.6	3.4
Calcium (mg/100 g)	Cheese	624.6	619.8	625.2	615.9	612.5
	Whey	39.3	39.4	39.2	39.3	39.2
Magnesium (mg/100 g)	Cheese	32.4	31.6	32.2	30.1	32.5
	Whey	7.0	6.8	6.9	7.2	6.9
Sodium (mg/100 g)	Cheese	589.2	584.9	587.0	590.3	587.1
	Whey	35.3	35.3	34.6	35.5	34.9
Kalium (mg/100 g)	Cheese	53.0	50.7	55.4	52.8	52.3
	Whey	102.8	100.4	103.5	102.0	103.1
Humidity %	Cheese	53,62	50,14	48,06	49,68	54,37

From these data may be observed a higher acidity in samples with selenium supplement. While in cheese samples the acidity increase is almost linear, in whey samples was no remark of a significant acidity growing. In according with this parameter, we infered that selenium stimulates development of lactic bacteria – evident issue in cheese samples, where the lactic bacteria are in abundance. For whey case, we may suppose the same issue and a logical explaination (empirical) for the lower acidity growing comparing with cheese can be the selenium bonding at proteins from cheese, while in whey the protein content is significant lower in comparison with cheese. This bonding of selenium may be similar to calcium bonding in casein:





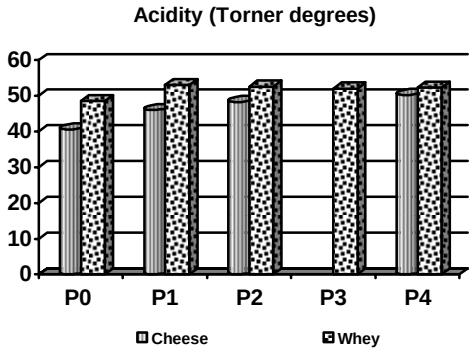


Fig. 1. Acidity of cheese and whey.

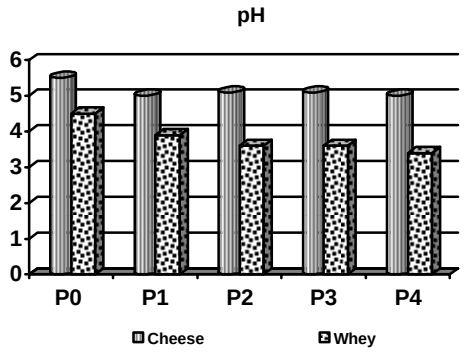


Fig. 2. pH of cheese and whey.

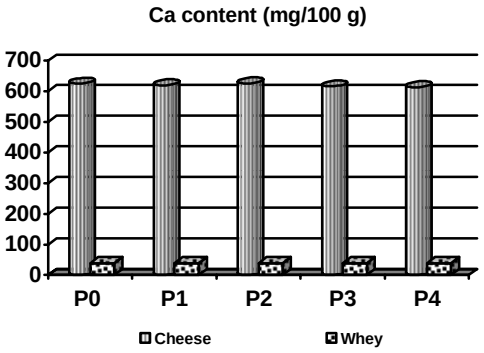


Fig. 3. Calcium content in cheese and whey

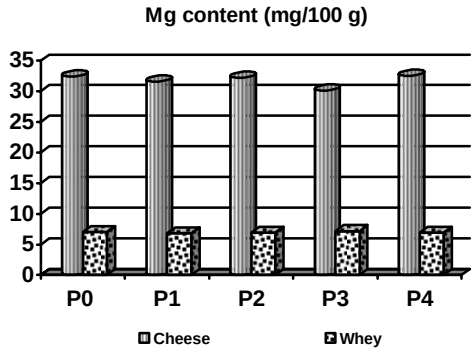


Fig. 4. Magnesium content in cheese and whey

Lowest pH values were remarked in samples with the highest selenium content and reverse.

The content of major mineral elements in both kinds of sample is presented in figures 4, 5 and 6. The mineral content from whey makes from it a precious subproduct for zootehnical area, where whey can be administated in fodder of some animals.

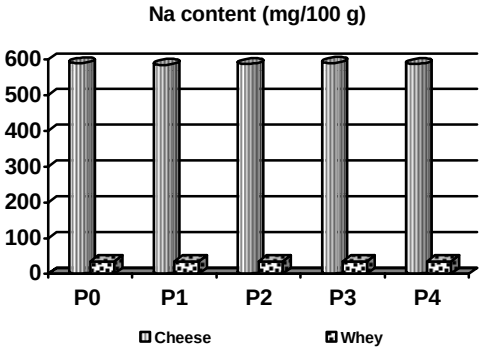


Fig. 5. Sodium content in cheese and whey.

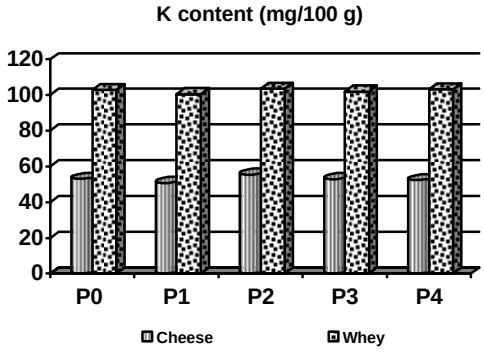


Fig. 6. Kalium content in cheese and whey.

The water content from cheese was situated between 48 and 54%; this values frame in maximum legal limits (60-70%) for this product. We have to mention that this parameter didn't correlate with selenium added in cheese.

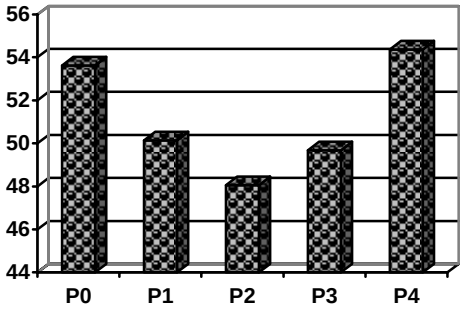


Fig. 7 - Humidity of the cheese.

4. Conclusions

The protein from dairy products can be an precious source of selenoprotein in human nourishment.

Selenium supplementation through fresh cheese is a newly product on the romanian market. This issue is very benefical for romanian consummer, because first the fresh cheese is considered a dietetical food, and on the other hand cheese by selenium adding may be considered a „functional food", while the romanian soil is very poor in selenium.

The selenium benefit can be demonstrated for all consummer (children or adults, health or with health problems), selenium beeing known as a strong antioxidant. In asociation with C and E vitamins, the antioxidant capacity grows. Included in fresh cheese, selenium is easier to asimilate by the consummer's organism, having in view that the „support" – fresh cheese – beeing „light" is recommended in each nourishment regime.

Through the advantages of fresh cow cheese, we have to remark that cheese can be prepared in various kinds: cheese creams with diverses vegetables or spices (pepper, dill, ketchup, cumin, onion, garlic, paprika, etc.), appetizers (liptauer, tomato fiil with cheese, etc.) all being savoury an healthy.

The major disadvantage of selenium supplementation in cheese is the disagreably (pungent) smell which the product gets after obtaining. This inconvenience is diminished in time (in 24 hour it entirely dissappears). For the camouflage of this smell is recommended adding of some anterior mentioned ingredients. In the case of patisery products preparation with fresh cheese (including selenium) we recomand the adding of vanilla or other specific food flavour or esences.

Our new product „fresh cheese with selenium" presents sensorial and physical-chemical characteristics similar with the basic product (without selenium). However, we observed a light growing of acidity in concordance with selenium growing doses. This fact requests an increasing concerning about packing, preservation and valability terms of this product in comparison with the basic product.

The sensorial exam didn't remark major differences between basic product and the product with selenium, excepting smell.

The whey remaining after the cheese production is very valuable for zootechnical area due to its mineral content.

The physical-chemical parameters for the analized products framed within the legal limits of romanian commercial legislation.

The necessary tests for introducing this product on the market will continue. We included in this paper only a few of them; other testing works will be soon accomplished.

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