

## Nitrites Variation in Cheese depending on their Concentration in Milk

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### Abstract

In order to follow the modifications in time of milk nitrites quantity which are contained in cheese, we created the following experimental model. From the same known milk quantity with a known fat content we formed 4 milk control groups in which we added different sodium nitrites quantities (20, 40, 60 mg sodium nitrites in 100 ml milk). After each milk control group processing we analyzed the clot and the whey in order to establish the nitrites content. We performed analysis from cheese and salt over 21 days with one week break.

Obtained results evidenced that during cheese processing the nitrites quantity is 3 times reduced depending on nitrites milk content.

During maturation nitrites are distributed in cheese and salt and are progressively reduced leading after 21 days to a decrease under the maximum admitted level of 7 mg%.

**Keywords:** Nitrites, cheese, milk.

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### 1. Introduction

Nitrates and nitrites contained in feed cannot reach the milk of ruminants which consume them, because a large part are degraded by ruminal microorganisms and are used for self production of nitric substances. Milk and milk products can be polluted with such bad substances by accident or through water used in the technological process of harvesting and fabrication, or by atmospheric air, rich in nitric oxide surrounding industrial metallurgic centers [1,2].

It becomes necessary to know not only the content of milk and milk products in nitrites and nitrates in order to avoid their commercialization but also the natural capacity of milk and milk products to eliminate them after they reach the milk.<sup>1</sup>

The purpose of our work was to evidence the natural capacity of milk and cottage milk to eject

in time a certain amount of nitrites added deliberately in milk[3,4].

### 2. Materials and methods

In order to evidence if milk and cheese possess a denitrifying capacity we initiated the following experimental model. In each of four different recipients we put 250 ml milk with a well known fat content. The first recipient contained 20 mg sodium nitrite, the second one 40 mg, and the third one 60 mg NaNO<sub>2</sub>. The fourth sample was the control sample containing no NaNO<sub>2</sub>.

After adding 2 mg CaCl<sub>2</sub> and lactic bacteria to the milk, we performed clotting with 1,25 ml pepsine, and the clot was afterwards transformed to cottage cheese using a well-known technology and was kept in salty water for a period of 21 days. Immediately after milk clotting and after 7, 14, 21 days each sample was analyzed for NaNO<sub>2</sub> content, first the clot and whey and then the cheese and the salty water.

In order to know in which way the fat milk content can influence the denitrification cottage

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cheese process, the same procedures mentioned above have been repeated on milk and cheese samples with different fat content (0,1%, 1,5%, 3,5% fat).

### 3. Results and discussion

Analyzes performed after several hours after milk clotting and whey extraction from the clot evidenced that  $\text{NaNO}_2$  added to milk containing 0,1% fat is distributed both in the clot (39%) and in the whey (61%). The more milk is richer in fat the more the  $\text{NaNO}_2$  proportion in the clot is increasing (40% for milk with 1,5% fat and 42% for milk with 3,5% fat). During cottage cheese preservation in salt, a large amount of  $\text{NaNO}_2$  is released in the salty water. After 7 days of keeping the cheese in salty water, the cheese contains only 40% of  $\text{NaNO}_2$ , which was present in the clot.  $\text{NaNO}_2$  proportion which was extracted from cheese in salty water increases to 80% in the case of cheese obtained from milk with more than 20mg%  $\text{NaNO}_2$  (40, 60 and 100 ml milk). Figure 1, 2, 3 evidence our results regarding the concentration dynamics in  $\text{NaNO}_2$  in cottage cheese obtained from milk with different concentrations of fat during 21 days. In figure 1 we showed the dynamics of  $\text{NaNO}_2$  quantity in the cottage cheese,

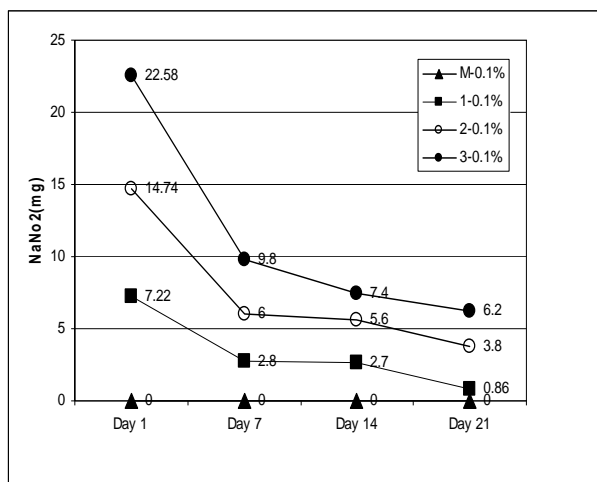


Figure 1 Variation of cheese nitrites quantity during maturation in samples with 0,1% fat

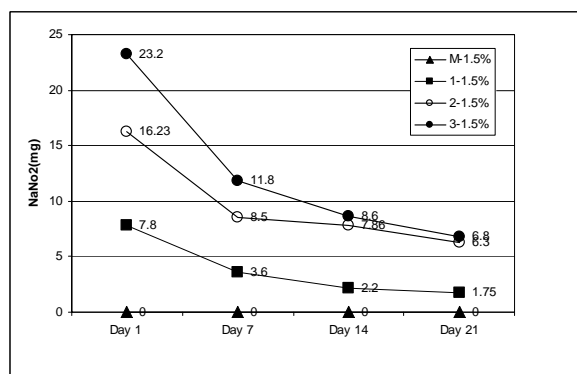


Figure 2 Variation of cheese nitrites quantity during maturation in samples with 1,5% fat

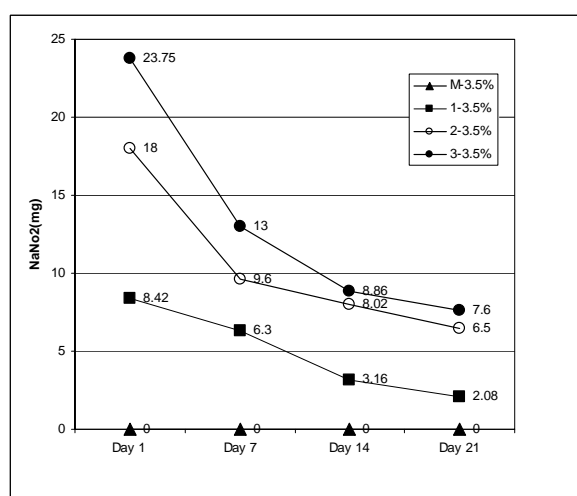


Figure 3 Variation of cheese nitrites quantity during maturation in samples with 3,5% fat

obtained from 0,1% fat milk and we observed that after 7 days nitrite concentration decreases at half, no matter its concentration in the processed milk. Its concentration in cheese decreases slowly in the next 2 weeks, and after 21 days, it reaches a concentration of under 1 mg per 100 g cheese for the cheese obtained from 20 mg nitrite per 100 ml milk. After 21 days the nitrite concentration is higher in cheese obtained from milk where nitrite was added in a proportion of 40- 60 mg per 100 ml milk.

Our analysis evidenced that the denitrification process of cottage cheese during 21 days of keeping it in the salty water, has two pathways. One of them is the migration of  $\text{NaNO}_2$  from cheese into salty water in a high quantity and depending on its concentration in cheese. The other pathway of cheese denitrification takes place perhaps with the help of enzymes produced by

microorganisms which are present in cheese and in salty water. The process of cheese denitrification follows the same pathway and takes place approximately with the same intensity both in cheese obtained from 0,1% fat milk and also in the one containing 1,5% and 3,5% fat. The higher the fat content of milk the higher the content of nitrite in the clot. This leads to the fact that the denitrification process in cheese obtained from a milk with a higher concentration in fat, cannot achieve after 15 days of keeping a level inferior to 1,7- 2 %.

#### 4. Conclusions

Our research leads to the following conclusions:

1.  $\text{NaNO}_2$  concentration in milk after clotting is distributed as follows: 40% in the clot and 60% in whey
2. The fatter the milk, the higher the nitrite concentration in the clot.
3. Nitrites in cheese preserved in salty water up to 21 days decrease to a not dangerous level for the consumer, if their concentration in milk is inferior to 40 mg at 100 ml.
4. Cheese denitrification while maintenance takes place by passing of a large amount of nitrites into salty water but also through its degradation with the help of microbial enzymes which are present in cheese and salty water.

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