

## Influence of packaging on the quality of soft brine cheese fortified with seaweed additive

Nataliya Ryabchenko

National University of Food Technologies, Kyiv, Ukraine

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### Abstract

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#### Corresponding author:

Nataliya Ryabchenko  
E-mail:  
nata431@yandex.ru

**Introduction.** The aim of the article is to study the influence of different ways of packaging and storage on consumer properties of soft brine cheeses, as well as changes in quality during storage. Soft brine cheeses fortified with dietary supplement have organically bound iodine that can prevent a lack of iodine in human nutrition [1-3].

**Materials and methods.** The objects of research were new soft brined cheeses: "Sample 1" – with the addition of supplement from brown seaweed in an amount of 0.5% to weight of cheese, "Sample 2" – with supplement of brown seaweed in an amount of 0.5% and with serum albumin in an amount of 0.3% to weight of cheese. "Sample 3" – produced by thermoacid method with the addition of supplement from brown seaweed in an amount of 0.5% to weight of cheese. "Control 1" – was soft brine cheese produced by the traditional method. "Control II" – soft brine cheese produced by thermoacid method according to traditional recipe. Soft brine cheeses were investigated immediately after production and on 2, 3, 5, 10, 30, 45, 60 days. Sensory evaluation of quality the new soft brine cheeses was carried out according to the developed by us 5-point scale. The amino acid composition – by ion-exchange liquid-column chromatography (the amino acid automatic analyzer T 339).

**Results and discussion.** According to research results brine cheeses maturation for 14 days in brine and subsequent packaging and storage (at 2 ... 5 °C for 60 days) in plastic bags "Saran" has a positive effect on its quality. In the soft brined cheese "Control 1" quantity of free amino acids have increased by 19.8%, whereas at the soft brined cheese "Sample 1" quantity of free amino acids have increased by 21.2%, at "Sample II" – quantity of free amino acids have increased by 20.8%. "Control II" was characterized by an increase in the quantity of free amino acids by 7.7% in case of packaging in plastic film. At the same time, "Sample III" was characterized by increasing of quantity of free amino acids to 22.2%. This method of storage pickled cheeses slows down the process of moisture loss, promotes intensification of proteolysis and increased levels of free amino acids, which positively affects the organoleptic characteristics.

**Conclusions.** The obtained results allow us to improve the method of ripening and packaging of soft brine cheeses, their consumer properties.

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## Introduction

One can store and form the application properties of brined cheese at the proper level under condition of using an appropriate package, packing, creating the optimal regimes and periods of storage, transportation [4].

Consumer demand and requirements of trade cause various types of packaging, the range of which is also affected by changes in the environment. Forming and packing equipment offers new opportunities. In a market conditions an appearance, label design and quality of packing materials are important. The main trends in packaging of brined cheese are diversification, improvement of quality indicators, attractive packaging and label, convenience when consumed [5].

In Ukraine, along with the classic type of packaging such as glass, paper, and polymer packaging plays an important role in the food industry that is widely used for packaging of cheese [6].

Such requirements are imposed on polymer films packing [7]:

- general – non-toxicity, mechanical strength, neutral to taste and smell of packed product;
- special: low oxygen permeability (less than  $400 \text{ sm}^3/\text{m}^2$  per day) to prevent mold; limited moisture permeability (less than  $0.02 \text{ kg}/\text{m}^2$  per day) to prevent drying of the product; permeability to  $\text{CO}_2$ , which is formed during cheese ripening ( $500 - 2500 \text{ sm}^3/\text{m}^2$  per day).

In general the packaging, especially the consumer packaging, is important for all dairy products and specifically for cheese. Firstly, because these products are perishable, unless they are stored in the appropriate conditions. Secondly, the storage conditions are too individual for different kinds of cheese. Using different methods and conditions of use of brined cheese, the manufacturers of these products are constantly improving packaging, matching it considering the shelf life, packaging weight, ease of use. The following effects on choice of packaging for cheese: consumer demand, which depends on its income, demographic changes, local habits and traditions of food consumption [8].

“Active” and “smart” packaging which regulates microbiological processes occurring inside the package, and which reports on the status of the product, guaranteed health and safety of consumers can save quality of products.

“Active” and “smart” packaging emerged in economically developed countries (USA, Australia, New Zealand, Japan and Western Europe) according to the project of the European Union ASTIRAK (1999–2001), which provides an assessment of safety, impact of “active” and “smart” packaging on environment, creation in the field of legal rules [9].

The main function of “active” packaging is the impact on a product extension of its shelf life and storage characteristics: taste, color and so on. The material from which the packing is made is biologically active: a polymer matrix tightly holds immobilized supplements (e.g., potassium carbonate compounds, enzymes, gas and moisture absorbers, fragrances, antimicrobials).

The abovementioned packing allows you to regulate microbial balance inside the packaging, shelf life of the product. Modified and adjustable air is mostly used in the “active” packaging. This quite expensive technology, however, is compensated through its use.

The advantage of “active” packaging is that the migration of chemicals in foods is close to the minimum. “Smart” packaging is intended to respond to the impact of the environment on the condition of the product and to inform consumers of this state. The cost of such packing is high, as it requires the use of modern dyes (thermochromatic dye 767

VK) and even microprocessors. However, a significant part of materials for "smart" packaging is still under development and experimentation.

Packaging for cheese is characterized by general trends of development – this is the minimization of material resources through the use of polymer films, including multilayer, which prolong the shelf life of the cheese due to the high barrier properties. It is important that manufacturers of cheese take into account the customer requirements regarding usability of packaging when products are consumed.

For packing of brined cheese the consumer and transport packaging are used. A bag of polyethylene film, polypropylene containers (plastic containers with a capacity of 350, 500g), glass jars or other containers made of polystyrene serve as consumer packaging. The metal containers are rarely used (up to 5 kg). Brined cheese is packed in shipping containers of a net up to 5.0 kg. Packing of cheese in brine in buckets of polystyrene is allowed under the current legal documents.

During packaging the hygienic indicators, water and gas impermeability, and level of protection against light are important to preserve the quality of a food product. During packaging under vacuum the film should fit tightly to the surface of the cheese. During vacuum packaging the oxygen level inside the packaging is reduced to less than 1%. Barrier properties of polymer films prevent the penetration of oxygen into the vacuum packaging. Due to the vacuum plastic packaging the shelf life is increased depending on the type of cheese from 60 to 90 days [10, 12].

Polymer film of polyvinyl chloride (PVC) is often used in the production of brined cheese. This is explained by ease of its use, thermal stability in the temperature range (from -10 °C to 75 °C), the possibility of overprint, low permeability of air, steam, gas and odors; resistance to fats and oils. Ripening of brined cheese in a film helps to reduce the cost of labor associated with caring for cheese during ripening, the decrement of product loss. The use of film in vacuum at cheese packaging has a positive effect on the quality of cheese and accelerates their ripening.

The prolonged ripening and storage of cheese in brine environment is the result of the traditional conditions of the brine cheese production in Ukraine. Although brine well preserves the product from damage, but this method of ripening and storage degrades the quality of cheese during prolonged staying in brine. Therefore, we conducted research on the impact of various types of packaging on the quality of soft brine cheese.

## **Materials and methods**

The objects of research were new soft brined cheeses: "Sample 1" – with the addition of supplement from brown seaweed in an amount of 0.5% to weight of cheese, "Sample 2" – with supplement of brown seaweed in an amount of 0.5% and with serum albumin in an amount of 0.3% to weight of cheese. "Sample 3" produced by thermoacid method with the addition of supplement from brown seaweed in an amount of 0.5% to weight of cheese. "Control 1" – was soft brine cheese produced by the traditional method. "Control 2" – soft brine cheese produced by thermoacid method according to traditional recipe. Soft brine cheeses were investigated immediately after production and on 2, 3, 5, 10, 30, 45, 60 days. Sensory evaluation of quality the new soft pickled cheeses was carried out according to the developed by us 5-point scale. The amino acid composition – by ion-exchange liquid-column chromatography (the amino acid automatic analyzer T 339).

## Results and discussion

According to Table 1 brined cheese ripening research during 14 days in brine and ripening during 45 days in the film has a positive effect on its quality.

**Table 1**  
**Organoleptic assessment of quality of soft brine cheese depending on packaging**

Packaging	Taste and smell		Texture		Total
	Characteristics	Point	Characteristics	Point	
Control 1					
The ripening in brine during 60 days	Pure, satisfactory	4,2	Satisfactory, slightly dense	4,0	4,1
The ripening in brine during 14 days and after the ripening in the film during 45 days	Pure, good	4,5	Good	4,5	4,5
Sample 1					
The ripening in brine during 60 days	Pure, good	4,5	Good	4,8	4,7
The ripening in brine during 14 days and after the ripening in the film during 45 days	Pure, excellent	5,0	Excellent	5,0	5,0
Sample 2					
The ripening in brine during 60 days	Pure, good	4,7	Good	4,7	4,7
The ripening in brine during 14 days and after the ripening in the film during 45 days	Pure, excellent	4,9	Excellent	5,0	5,0
Control 2					
The ripening in brine during 60 days	Pure, satisfactory	4,4	Satisfactory, slightly dense	4,2	4,3
The ripening in brine during 14 days and after the ripening in the film during 45 days	Pure, good	4,9	Excellent	5,0	5,0
Sample 3					
The ripening in brine during 60 days	Pure, good	4,6	Good	4,8	4,7
The ripening in brine during 14 days and after the ripening in the film during 45 days	Pure, excellent	5,0	Excellent	5,0	5,0

Organoleptic indicators of cheeses “Sample 1”, “Sample 2”, “Sample 3” under study have more scoring than those related control brined cheeses.

In the above-mentioned method of brined cheese packing the improvement of their organoleptic characteristics as taste, smell and texture occurs. If the control cheeses are characterized by good organoleptic characteristics after the ripening in brine during 14 days and after the ripening in the film during 45 days, the experimental cheeses are characterized by excellent quality.

According to Table 2 cheese, ripening in the film slightly speeds up proteolytic processes.

**Table 2**  
**Content of free amino acids in soft brine cheese depending on packaging mg/100 g of cheese**

Content of free amino acids	Brine cheese	
	The ripening in brine during 60 days	The ripening in brine during 14 days and after the ripening in the film during 45 days
1	2	3
Control 1		
Total	65	85
Sample 1		
Total	240	300
Sample 2		
Total	245	300
Control 1		
Total	57	72
Sample 3		
Total	235	290

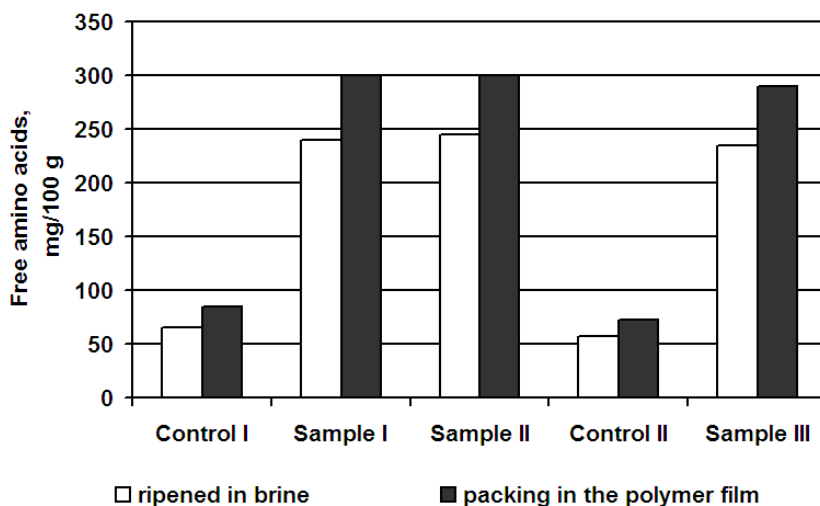
Low water vapor permeability of polymer package prevents desiccation of brined cheese, promotes uniform distribution of moisture and table salt all over its surface. Due to this the properties of cheese remain constant over the entire surface.

## Conclusions

Ripening of brined cheese in the film contributes to lower moisture loss during storage, which positively effects on the proteolytic processes in brined cheese [11]. The use of plastic film for packaging of brined cheese increases the amount of lactic acid microorganisms at all stages of its ripening in comparison with the cheese with the traditional method of packing.

Using a combined method of packaging has contributed to increase of the content of free amino acids. If the number of free amino acids in a raw cheese "Control 1" increased by 19.8%, then in the brined cheese “Sample 1” under research – by 21.2%, “Sample 2” – by 20.8%. Brined cheese “Control 2” is characterized by an increase of the content of free amino acids by 7.7% when packing in the polymer film. However, in the raw “Sample 3” their number increased by 22.2%. The use of a polymeric film for ripening of soft brine

cheeses under study contributed to the increase of free amino acids by an average of 20.6%, which had a positive effect on their organoleptic properties. Figure 1 graphically presents the results of the research of the content of free amino acids in soft brine cheese depending on the method of packaging.



**Fig. 1. Effect of packaging on the content of free amino acids of soft brine cheeses ( $\tau = 60$  days,  $t = 2 \dots 5$  °C)**

Thus, the production of soft brined cheese is expedient using the next method of ripening – 14 days in brine, followed packaging in a polymer film under vacuum and storage of 45 days at a temperature of 2...5 °C.

Further research will be aimed at a complex estimation of quality of soft brine cheeses.

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