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TRADITIONAL MANUFACTURING OF WHITE CHEESES IN BRINE IN SERBIA AND MONTENEGRO - SIMILARITIES AND DIFFERENCES

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This paper presents the results of a study dealing with the processes in the production of white cheese in brine, which are based on old, traditional technologies and are produced in Serbia (near Nova Varoš - Cheese from Zlatar) and Montenegro (Podgorica and the surrounding of Danilovgrad). In both cases, fresh cow's milk without heat treatment is used as a raw material. The paper presents the most important chemical quality parameters with the description of sensory properties. The autochthonous cheese in brine from both area, show distinct and characteristic sensory properties of the product, and also a high level of quality with the presence of certain individual differences. This research was aimed at a comparison of the autochthonous technologies, to save them from oblivion, and also to show the quality parameters of cheese which are similar according to the technological process, but are also very authentic.

KEY WORDS: white cheese in brine, traditional production, Serbia, Montenegro

INTRODUCTION

Autochthonous cheeses are products made from milk in specific geographical area as a result of many years of development in traditional production. The awareness of the characteristics in such production is aided by the growing demand for organic and high quality food with labels of origin, whose market price, in comparison with conventional products, significantly increases from day to day. Today, native cheeses, are characteristic of nations, states and regions, i.e. wealth and material part of the heritage of each country. They are products of various flavors and consistency in relation to the industrially produced cheese, where the technology is strictly defined and controlled (1). Their specificity is mostly related to the climate, geography, soil conditions, water, botanical composition of natural meadows and pastures, breeds and breeding dairy cattle, as well as traditional habits and customs of local people (2).

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Autochthonous cheeses are mostly produced from raw milk, without the use of starter cultures. Their authenticity, which distinguishes them from other cheeses of the same type but other region is based on, among the other things, characteristics and diversity of indigenous microorganisms, primarily lactic acid bacteria (LAB), which represent a significant potential in the selection of technological and protective bacterial species (3, 4). The addition of commercial culture in autochthonous cheese production would lead to the loss of the authenticity (5).

One of the most important representatives of autochthonous white cheese in brine in Serbia is cheese of Zlatar. It is made from uncooked whole cow's milk near Nova Varoš, at the foothills and mountain slopes of Zlatar. Cheese production is taking place in rural households, frequently during the summer breeding cattle on the mountains in summer cottages. This method of processing milk was used in past more often.

In Montenegro, production of white cheese in brine is dominant, according to the diffusion and volume of production. In their household production, no procedures of standardization and pasteurization of milk and clean, starter organisms are used (1). It is usually produced in northern and north-eastern region and in the far south of Montenegro. Enclosed in a number of sites, the indigenous production is retained and now have the names of the areas in which are produced. In the area of Podgorica and Danilovgrad, the production of salt soured white cheese is developed and it defers, despite the mutual proximity of production sites, characterized by differences in technology.

This paper presents the results of a research into the manufacturing process of the indigenous white cheese in brine, which is produced in Serbia (near Nova Varos - Zlatar cheese) and Montenegro (Podgorica and Danilovgrad surroundings). The paper describes the most important chemical parameters of quality of the cheese along with a description of their primary sensory characteristics.

EXPERIMENTAL

Recording indigenous technology of Zlatar cheese was performed by interviewing the individual producers in the villages near Nova Varoš. Each of the interviewed manufacturers (6 of them) had a conditional and registered facility for the production of cheese, and in this area represents a good host and producer. The laboratory study was carried out on samples of ripened Zlatar cheese which were ready for consumption and the designed tests were performed in three replicates. Part of the activities which includes a terrain part in Montenegro was carried out in 10 households in the municipalities of Podgorica and Danilovgrad. Each household is also traditionally engaged in the production of white cheese in brine. The laboratory tests were performed on mature cheese samples, after 3-4 weeks of ripening.

The basic chemical quality parameters of Zlatar cheese (water content, total solids, fat content, sodium chloride) were determined in the laboratory of the Institute of Meat Hygiene and Technology, Belgrade. The analyses were performed by accredited and regulated testing methods (6), and the evaluation of the results was carried out in accordance with legal regulated standards of the quality of milk products (7, 8).

Chemical analyses of cheese from Montenegro were performed at the Dairy Laboratory of the Biotechnology Faculty in Podgorica. The analyses (dry matter content, fat content, salt content, protein content) were performed using FTIR spectrophotometry on MilkoScan FT 120 FT. Milk fat content in dry matter of cheese and the water content of fat-free cheese was determined in both cases by computation.

RESULTS AND DISCUSSION

Characteristics of the autochthonous Zlatar - Serbian cheese

A survey conducted in order to collect valid data about the indigenous production of Zlatar cheese showed that for this purpose use is made of full-fat cow's milk that was not heat treated. Immediately after milking, the milk is squeezed through cheesecloth and treated with rennet produced from stomach of calves (rennet one tablespoon per 10 liters of milk). Making of the curd takes about 2 hours. For better separation of whey, curd is cut into larger or smaller cubes, usually of the size 10x10 cm. After that, the formed curd is transferred to the cotton gauze and hung on wooden hooks or specifically on tables to achieve the necessary straining and self-pressing. This phase lasts up to 1 hour. In the next phase of pressing the curd is transferred to a surface (the lump "rearrange"), the ends of rag is set so as not to leave a big hole in the center of the cheese, and it is placed a wooden board ("Circle") which is loaded with stone. This phase lasts about 1.5 to 3 hours. The pressed clump, thickness up to 2 cm, is cut into regular slices in a square, measuring about ten inches, to fit into the appropriate wooden container. However, at this type of packing the price of production is higher, so the most cheese producers use the plastic containers of 5 and 10 kg. Sometimes, during the new stacking slices of cheese, old brine is changed with new one. Manufacturers of Zlatar cheese determine the amount of salt used based on many years of experience (one closed fist of salt per pound of cheese). After each series of products, or when the container is loaded, the cheese is pressured with a stone. The process of indigenous cheese ripening takes about 20-60 days, depending on time of year, i.e. the temperature of the ambient in which the cheese is ripening. In the summer production of cheese, more cautions should be taken. These elements of Zlatar cheese production are consistent with earlier defined terms, reported by some of the authors of the present study (9, 10).

The slices of Zlatar cheese are white-yellow to white color, regular shape and uniform thickness of about 1.5 cm. The smell is pleasant, distinct and lactic acid which is the characteristic for this type of cheese. On the sections, cheese dough is tight, monolithic, porcelain look with a small number of small cavities arranged properly. The taste is full, distinctive, characteristic acid and moderately saline.

Characteristics of the indigenous production of cheese in brine – Montenegro

Producers from Podgorica and Danilovgrad, for the preparation of white cheese in brine use, exclusively fresh cow's milk. Since no thermal treatments in the preparation of cheese is applied, it is important that the milk comes from healthy animals, and also that

the milk is with proper hygiene, with the hygiene controlled processes. After milking, depending on the need, milk is heated in pots up to 20 to 30°C. Rennet is added to the heated milk to the amount that will coagulate milk for 1.5 to 6 hours. The formed curd is cut crosswise, than into cubes, sized 5-6 cm. Green and clear whey from the curd that comes out is a sign that the milk was clotted. The cheese curd is transferred to the canvas and than hang on the hooks, to allow easy drying, with occasional manual shaking to helps out as more whey. When the whey no longer goes out, the squeezed curd is placed on the cheese-making table and pressed by wooden plank and stone to make the appropriate pressure or using the court, buckets, etc. Pressure should be around 1-2 kg per kg of cheese curd. Squeezing and pressing if the curd takes 2 and 24 hours, i.e. until the cheese curd is drained well. After squeezing, the curd is taken out of canvas and cut into slices that are thicker in the winter, and thinner in the summer. Each slice is treated by salt, and when the salt is being absorbed, the slices are stacked in the container for ripening (wooden drums). Ripening takes 2- 3 weeks. Good hygiene is necessary and then cheese can be stored for weeks (11, 12).

White cured cheese slices are characterized by mild-sour odor and porcelain-white color soft consistency, and compact structure. On the sections, smaller and larger number of holes is seen, and they are filled with the solution, which matures and in which the ripening process is completed.

Comparing these autochthonous technologies in cheese production in Serbia and Montenegro, certian similarities in their preparation can be noticed (Figure 1 - a, b, c, d, e).

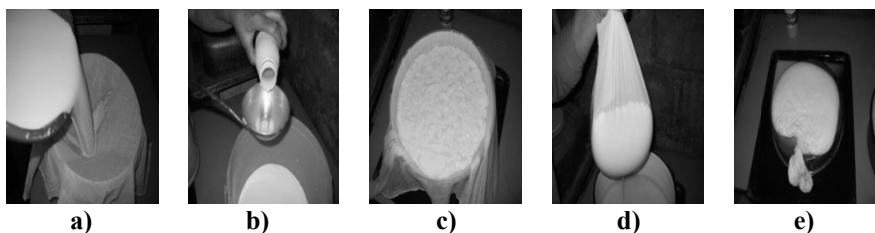


Figure 1. The procedures in the preparation of autochthonous cheese, investigated from Serbia (Zlatar cheese) and Montenegro: a) Filtration of fresh heated milk, b) Adding the rennet to the milk, c) Cheese curd, d) and e) Pressing the cheese curd

Chemical composition of the traditional white cheese with brine produced in Serbia and Montenegro

Chemical composition of the traditional white cheese in brine, originating from Serbia (Zlatar cheese) and Montenegro is shown in Table 1 and 2. On the basis of the determined values of water content in fat-free dry matter of cheese (Zlatar cheese 31 ± 0.38 ; white cheese from Montenegro 68.3 ± 3.63), and on the basis of their consistency and appearance, all of the samples belong to the category of cheese in brine. Based on the percentage of milk fat in dry matter of cheese (Zlatar cheese $54.24 \pm 5.90\%$, and white cheese from Montenegro, 53.11 ± 4.45), the samples belong to category of full-fat cheeses.

Table 1. Results of the chemical analyses of the cheese – Serbia

Chemical quality parameter	The determined values of Zlatar cheese - SERBIA		
	X _{min.}	X _{max.}	X _{av.} ± SD
<i>Dry matter, %</i>	41.99	46.95	44.46 ± 2.49
<i>Fat, %</i>	20.50	28.00	24.25 ± 3.75
<i>Salt, %</i>	2.25	3.68	3.15 ± 3.90
<i>Water on cheese fat-free dry matter, %</i>	72.88	73.68	73.31 ± 0.38
<i>Milk fat on cheese dry matter,%</i>	48.74	59.64	54.24 ± 5.90

SD - standard deviation; X_{min.} - minimum value; X_{max.} - maximum value; X_{av.} - average value

Table 2. Results of the chemical composition of the cheese – Montenegro

Chemical quality parameter	The determined values of cheese - MONTENEGRO		
	X _{min.}	X _{max.}	X _{av.} ± SD
<i>Dry matter, %</i>	46.17	63.55	50.41 ± 4.02
<i>Fat,%</i>	22.49	39.36	26.88 ± 4.08
<i>Salt, %</i>	1.88	3.69	2.99 ± 0.49
<i>Protein, %</i>	14.37	21.78	18.82 ± 2.06
<i>Water on cheese fat-free dry matter, %</i>	60.11	73.91	68.30 ± 3.63
<i>Milk fat on cheese dry matter,%</i>	47.37	62.40	53.11 ± 4.45

The results obtained in both types of autochthonous show some deviation, depending of the sample. This could be expected (10, 13-16), since the samples were taken from different households. During production processes, the households were using raw milk with different content of milk fat and proteins. The technology itself is based on roughly similar principles, but some production phases have their own characteristics.

CONCLUSIONS

The differences in the quality of autochthonous cheeses in Serbia and Montenegro are the result of the differences in production practices and creative producers, as well as other factors such as climate, vegetation, geographical factors, habits and tastes of local consumers and customers. Also, significant is the impact of earlier modes of production which have left traces in the traditional dairy industry of both countries. Recording technology of autochthonous cheese production and the creation of records about them are the necessity for saving the traditional technology from oblivion. The data obtained may serve as the basis for creating standardized production procedures, leading to the uniform

quality of these products. Therefore, traditional dairy should not be seen as a return to the past, but as an effort to preserve the indigenous technology, to gain their organized form, the ethnographic richness of a given region so distinctive, a time stamp to the development of a nation. The affirmation of indigenous dairy products directly influences the development of livestock on the one hand, and the identification revival of the pertaining areas, on the other.

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ТРАДИЦИОНАЛНА ПРОИЗВОДЊА БЕЛИХ СИРЕВА У САЛАМУРИ У СРБИЈИ И ЦРНОЈ ГОРИ – СЛИЧНОСТИ И РАЗЛИКЕ

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У овом раду представљена су истраживања која су имала за циљ да опишу поступке производње меких белих сирева који су засновани на старим, традиционалним технологијама, а који се производе у Србији (околина Нове Вароши – златарски сир) и у Црној Гори (околина Подгорице и Даниловграда). У оба случаја, као сировина, користи се свеже кравље млеко, без претходне термичке обраде. У раду су дати најважнији хемијски параметри квалитета уз опис и оцену сензорских својстава. Сензорска својства аутохтоних меких белих сирева у саламури, са оба локалитета, показују особена и за производ карактеристична сензорска својства, као и висок ниво квалитета уз постојање одређених индивидуалних одступања.

Наведена истраживања имала су за циљ да се аутохтона производња белих сирева у саламури опише, као и да се прикажу параметри квалитета сирева који су слични по технологији припреме, али и веома аутентични.

Кључне речи: бели сиреви у саламури, традиционална производња, Србија, Црна Гора

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