

**PRESERVATION AND CARE OF INDIGENOUS SJENICA CHEESE DURING
RIPENING PROCESS**

Zeljko SAVIC*, Nebojsa LALIC

University of Pristina, Faculty of Agriculture, Kosovska Mitrovica-Lesak, Kosovo&Metohija, Serbia

*(Corresponding author: zeljkosavic65@hotmail.rs)

Abstract

Sjenica cheese is one of our best types of cheese from the group of white cheese in brine. It is produced by indigenous technology in the area of Sjenica-Pešter plateau. The process of production takes place at individual farms, among which larger manufacturers exist. The raw material for the production of cheese is fresh, whole sheep and cow milk, which process of making cheese starts immediately after milking, without thermal treatment. Studies were performed over a wide area of Sjenica-Pešter plateau, by a method of survey. The survey was conducted in forty households, and it included questions related to raw materials, the very method of making cheese and process of production. Special emphasis is given to the conditions of storage, ripening and to the system of preserving cheese. The results showed that microclimate conditions have an important role in the system of storage and preserving cheese in the places for storing and ripening. This is especially important during the summer months, when high temperatures can cause serious defects and deficiencies of cheese, such as increased acidity, porosity, poor structure and rheological properties of cheese. Sjenica cheese is kept in a salt-brine whey which is released by the cheese, or it can be added. Brine provides the anaerobic conditions of storage and ripening, and also serves as a preservative. Taking care of cheese is consisted of regular cleaning of cheese surface and the inner walls of tubs, control of levels of brine and regular replacement of the same. Critical period of preservation are the first 15-20 days after the process of production, and its washing and cleaning is done twice a week. If necessary, regular process and control of level of brine and its replacement, are done twice of week, too.

Key words:Sjenica cheese, storage, ripening care.

Introduction

Hilly area has remained the center of indigenous production and processing of milk into dairy products. A typical representative of this group of products is Sjenica cheese. It is produced

by indigenous technology on individual farms of Sjenica-Pešter plateau area, from raw whole cow, sheep and mixed (sheep and cow) milk that turns into cheese without thermal treatment (Savi , 2011).

Sjenica cheese belongs to a group of white cheese in brine. One of the characteristics of this group is the cheese storage and ripening in brine, which is used as a preservative, provides the anaerobic conditions of storage and ripening, giving specific lactic sour and salty taste and contributes to brittle structure of these kinds of cheese (Codex Stand. a2, 2000).

Storing and ripening in brine requires special care during ripening system that significantly depends on the microclimate conditions in the facilities, because the production, storage and ripening of cheese mainly occur in the same places (Macej etal.,2006)

Cheese ripening time is the longest and most important operation in the production of cheese. Desired sensory characteristics and quality of cheese under controlled conditions of temperature and relative humidity, are depending on the type of cheese and the ripening lasts to mature for a few months to two years (Wilkinson, 1990).

During cheese ripening, complex biochemical and physicochemical changes occur, starting even from the raw milk and addition of rennet starter cultures. These changes usually occur in proteins, milk sugar and milk fats. (Fenelon & Guinee 2000, Fox 1989, Fox & Cogan 1990).

During ripening process, complex biochemical and physical chemical changes do not only occur, but structural changes and the quality of transformation in zero curd cheese also occur. Actually, the grain structure, is eventually turning into a quality homogeneous mass, which has the taste, aroma and texture characteristic of a particular type of cheese (Jovanovi, 2001).

A number of authors (Beresford et al., 1998, Fox & Cogan, 2000, Ross et al., 2000) consider the ripening of cheese as essentially enzymatic process, and in the process of ripening the following agents participate: wide, native enzymes of milk, starter culture and other non-starter bacteria.

White brined cheese is produced from raw, thermally not treated milk. This means that a significant role in proteolytic processes during ripening process, has native milk proteinase. In addition, in the production of these types of cheese, starter culture are not used and besides rennet addition and native proteinase, enzymes indigenous micro flora play a significant role. (Bara et al., 2006).

According to (Maj et al., 2009), high quality of indigenous types of cheese is the result of specific indigenous technology and high-quality grass and healthy pastures that are at an altitude of over 1,000 m, and that dairy animals are fed by.

Material and methods

Studies included in this paper were carried out over a wide area of Sjenica-Pešter plateau by a survey method. The survey was conducted in forty households, which are selected at random. Prior to execution of the survey, we had a detailed research, field visits and a selection of typical production site. The survey included questions related to raw materials, the process of cheese making, curd treatment (draining, pressing) and salting. Special emphasis is given to the conditions of storage, ripening, caring and keeping the cheese from the moment of production to the moment of sale. The survey, among other things, contained issues that are significant and have an important influence on the process of storage and the system of cheese care during ripening, such as the organization of processing milk into cheese, then a way of packaging and packaging and care procedures themselves during ripening and storage of cheese.

As these factors significantly affect the acidity of the cheese, in some household samples of ripened cheese were taken: four samples of cow, sheep and mixed (sheep + cow) cheese, by which the average values of titratable acidity are determined by the method of Ternner and acidity (pH).

Results and Discussion

The quality and overall value, durability and sensory characteristics of cheese, among other factors, significantly influence the microclimate conditions and a system of good and complete care of cheese during storage and ripening. The research result give a complete

picture of the conditions of production, processing method, the interest in increasing production and improving production technology and perspective of development of the entire area.

The organization of production: Depending on the size of farms and their organizations, cheese production takes place in the village throughout the whole year, and in households that go to the mountain-huts, production has seasonal character (May to October). Processing milk into cheese, ripening and storage are performed in facilities specifically designed for it. Buildings in the village are usually made of hard material while in mountain, dairy huts are made of different cheaper materials. But the best microclimate conditions for storage and ripening in summer months, provides dairy-hut with walls of wicker that provide good air circulation-draft, and the floors are of soil that is moistured regularly. The roof is covered with PVC foil, above which is a thick layer of straw, and thus excellent insulation is achieved. In these objects, a temperature in summer hardly exceeds 16-18C which is great for ripening and storage of cheese. The results showed that in the majority of households, cheese production, storage and ripening are performed in the same building in uncontrolled conditions, actually the preservation and ripening in the production area.

Stacking and packaging: Cheese is stacked successively in rows of arrival immediately after preparation. Along with stacking, salting of cheese is done. It is salted with coarse sea salt, and a way of salting applied dry salting. When one row of cheese is stacked and wooden circle put, a less burdensome stone weighing 1-2 kg is put on. Procedure is repeated after each complex cheese party until the vat is filled. When the vat is filled, a wooden circle and higher load is put on, a stone of average weight 3-6 kg depending on the size of the vat. Beside this mode, manufacturers apply the other, and that is to put on the load only when the vat is full.

When stacking cheese in vats, normal procedure is releasing whey which is done before each new row of cheese, until the vat is filled. To do this effectively, at the bottom of the vat there is an opening which is closed by a wooden plug. Draining whey is done in two ways. The first way of discharge of whey is that when the cap opens, the whey is released periodically, and then opening is plugged again. Another way to release whey is that the opening at the bottom of the vat is opened for as long as the vat is full, and thus whey continuously discharges. When the vat is full, and the burden is placed on the cheese, the hole is closed with a plug.

Such a procedure of stacking cheese, affects the structure which is fragile and brittle and when removing cheese from the vats, it is very difficult to extract and separate it into slices. In fact, at the moment of stacking of fresh cheese, the cheese contains a lot of whey, and when cheese mass with high water content is stacked and then load, comes "coalescence of slices, that when removing ripened cheese can not separate but are broken." Besides to its structure, the whey drain is reflected on other properties of cheese, especially the taste. If the whey is not drained, cheese would have been even of higher acidity as the curd that the young cheese releases after stacking contains significant amounts of lactose, which would lead to a significant increase in the acidity of the cheese while turning into lactic acid. The results showed that in terms of reducing the acidity of cheese, a much better way is a constant whey release, because it is fresh and leaves vat without fermentation. As these factors significantly affect the acidity of the cheese, in Table 1 their average values in the mature kinds of cheese are given.

Table 1. Values of titratable active acidity in mature indigenous kinds of Sjenica cheese.

Indicators	Kinds of cheese			
		Cow cheese	Mixed cheese	Sheep cheese
Titratable acidity ($^{\circ}$ T)	Min	197	191	196
	Max	220	224	246
	$\bar{X}(n=4)$	208	213	220
Active acidity (pH)	Min	3.80	3.83	4.43
	Max	4.94	5.71	5.36
	$\bar{X}(n=4)$	4.23	4.40	4.83

Based on the data in Table 1.it can be seen that the values of titratable acidity were high or low pH values, which is characteristic of this group of cheese.

Maturation: Maturation of Sjenica cheese is made in a salt-own cheese whey, which young soft cheese releases. Actually, during the production of cheese, curd processing is simple – which means curd is not cut but by procedure with it, is tended to keep as much water-whey in it. After stacking cheese in packaging and loading, the level of whey must be above the level of the cheese. If level of whey is lower, the whey must be poured and still be above the level of the cheese, by which anaerobic conditions of ripening are fully completed. Ripening process takes an average of twenty to forty days, although it is considered that the cheese is achieved commercial maturity after twenty days of ripening. Changes in cheese during ripening are the most intense in this period, and after that period, changes of the basic parameters of the chemical composition of cheese are less emphasized, so in the later period of ripening and storage, the cheese is conserved itself.

Sjenica cheese ripens and is kept in wooden vats as well as plastic buckets of different capacity. Savic, 2010., states that the wooden vat is original packaging for indigenous Sjenica cheese that is the best in terms of length of the quality of the cheese . However, market and consumers demands inevitably introduce other packaging, plastic of less volume.

Care: Caring of cheese is a very complex and sensitive issue. Care is especially important during the summer months in hot daytime temperatures. High temperatures can lead to serious flaws and shortcomings in cheese such as increased acidity of the curd, the occurrence of hole formation, poor structure and rheological properties of cheese.

Care contains cleaning of the surface of the whey and inner walls of vat from mold, regular control of whey level and pouring and changing.

Cleaning the surface of the cheese and brine from mold is performed in the following way: in fact, on the surface of the cheese is a circle and a stone whose diameter does not fully coincide with diameters of vats. Most of the mold is concentrated on the bottom area of a wooden circle, then on the bottom of the stone and on the inner wall of the vat, and a small amount remains in the cheese. Cheese surface and interior walls of vats are cleaned with pure cloth, a wooden circle and a stone are washed with clean water. Such care in summer periods is usually done twice a week, and in the autumn periods every 7-10 days. Besides washing the level of the brine is regularly controlled, which is added in need, so that its level is always

above the level of cheese. Change of brine depends on the storage conditions of the cheese. If the objects are exposed to draft (huts) and cool (hard material), brine does not change, or is changed once in period of June and October. More frequent replacement of brine is necessary during high summer temperatures and there is a risk of high acidity of the cheese, which is negatively reflected on the structure and rheological characteristics of the curd mass. As long as the brine is bright and airy, there is no danger for cheese. As soon as the brine is mixed up, and becomes viscous and drags into the long and thick filaments which are difficult to tear, such brine must be immediately changed.

The best quality of the cheese and its organoleptic characteristics are if brine is made from whey. However, in the absence of whey, that can happen during the autumn and winter months, brine can be made of the drinking water, but it is preferable to be a spring water, that is not chlorinated. Preparation of brine (presolac) is done by adding salt into whey or water, the water is boiled, cooled and so cooled pours into the cheese.

Conclusion

Based on the results, and these facts we can conclude the following:

- Indigenous Sjenica cheese ripens and is kept in uncontrolled conditions, usually at the site of production and the care is very complex and sensitive issue.
- Micro-climatic conditions in the facilities are crucial for storage, ripening and care of Sjenica cheese, and hence on the quality and durability of cheese.
- Since the most intense and fastest changes occur during the first twenty days of ripening, so at that time a special regimen of care and maintenance of cheese is conducted. In the later period of ripening care system is easier, because the cheese is itself "conserved" and can be stored for a longer period (6-8 months).
- Regular care of Sjenica cheese involves cleaning the surface of the cheese mold, controlling the level of brine and its reconstitution and regular replacement of the same.
- Original packaging, the best for quality of indigenous Sjenica cheese are wooden vats. However, the market and consumer demand the need for smaller commercial quantities, and therefore plastic packaging of smaller volumes are increasingly used.

References

- Bara , M., Jovanovi , S., Ma eji, O. (2006): Indigenous white cheese in brine-Monograph; Faculty of Agriculture, Belgrade
- Beresford, T.P. O'Reilly, C., O'Connor, P., Murphy, PM and Kelly, A. (1998): VTT Symposium "Fresh novel foods by high pressure." Ed. By Autio, K., Helsinki, 103-114
- Cheese symposium. Ed. By Cogan, TM, Me Sweeney, P.L.H. and Guinee, TP, MOOREPARK, 31-42.
- Codex Alimentarius (2000): Codex group standard for cheese in brine-codex stan 208-209, FAO/WHO of UN, Rome
- Fenelon, MA and Guinee, TP (2000): Flavour development in low-fat cheese. 6th
- Fox, PF (1989): Proteolysis during cheese manufacture and ripening. J. Dairy Sci. 72 (6), 1379-1400.
- Fox, PF and Cogan, TM (1990): Production and metabolism of lactate during cheese manufacture and ripening. Cheese 2nd symposium. Ed. by Cogan, TM, MOOREPARK, 63-70.

- Fox, PF and Cogan, TM (2000): Cheese: scientific highlights of the 20th century. 6th Cheese Symposium. Ed. by Cogan TM, Mc Sweeney, PLH and Guinee, TP, MOOREPARK, 83-121.
- Jovanovi , S. (2001): Ph.D. Thesis, University of Belgrade
- Ma ej, O., Dozet, N., Jovanovi , S. (2006): Characteristic of indigenous production of Sjenica cheese, cheese from Homolj, cheese from Zlatar and white cheese from Svrljig, Monograph “Indigenous white cheese in brine ”, Ur. Ma ej, O. Dozet, N., 33-65 , Faculty of Agriculture, Beograd
- Ma ej, O., Seratli ,S., Jovanovi , S, Radin, D, Vu i , T, Miloradovi , Z., (2009): Characteristics of the cheese with the addition of medicinal and aromatic plants, Food industry Number . 1-2, Beograd. VOL.20 , 123-129
- Savi , Ž., (2011): Change of nitrogen compounds during ripening of cheese in Sjenica type cheese, Ph.D. Thesis, Faculty of Agriculture, Priština - Lešak