

Acceleration of ripening kashaval cheese using starter culters with a high proteolytic activity

Georgiana Gabriela Codina*, Ana Leahu

* "Stefan cel Mare" University, Faculty of Food Engineering, 13th University Street, 720229, Suceava - Romania

Abstract

The research carried out on an industrial scale aimed to establish the opportunities and conditions of using a starter culture with a high proteolytic activity for producing the kashaval cheese Dalia from cow milk. Therefore, certain physical-chemical methods (humidity, acidity, protein content, fat content, salt content) have been used for evaluating a series of biochemical processes for the ripening of cured cheese and of the kashaval cheese obtained with and without starter culture addition. At the same time, a sensorial analysis was carried out for the finite products obtained.

Keywords: kashaval cheese, starter culture, ripening, sensorial analysis.

1. Introduction

The kashaval cheese is produced in a wide area represented by Balkan countries (Turkey, Greece, Romania, ex-Yugoslavia, Bulgaria, Albania) and by countries from the south of Ukraine, Caucuz and Crimea, but also Hungary, Italy, Alger, Tunis, Egypt and Maroc. Even though there are numerous types of kashaval cheese, the manufacturing process is relatively likewise for Balkan countries, Italy and Russia with slight variations [1].

The cheese known in our country as kashaval cheese is produced according to a special technique, which consists of scalding in water at the temperature of 72-80°C, uncured cheese of cow, ewe, or the mixture of both of them. After salting, the kashaval cheese is ripened in conditions determined for forming specific sensorial properties. From all types of manufactured kashaval cheese, Dalia is the most often produced now, using various commercial names and a great variety of presentation forms (round, square, rectangular, octagonal, triangular and so on) [2].

The continuous increase of kashaval cheese production to the national and international level, has enforced the utilization of starter cultures selected for assuring a controlled processing, a ripened accelerated faze, an improvement of sensorial and nutritional qualities, as well an increase of microbiological stability of the accomplished products acquired [3, 4, 5, 6].

In the current work a comparative study was made between the kashaval cheese obtained with and without starter culture addition which contains *Lactococcus lactis subsp.lactis* and *subsp.cremoris* with high proteolytic activity.

2. Materials and methods

In this experimental study two variants of kashaval cheese Dalia from cow milk have made: one without of starter cultures addition (witness sample) and one with starter culture addition with high proteolytic activity.

The kashaval cheese samples were obtained at S.C. Coza Rux S.R.L. Suceava. Typical for this kind of kashaval cheese is the

* Corresponding author: *e-mail address:* codinageorgiana@yahoo.com

scalding phase. The slices of uncured cheese are introduced into a basket which is submerged under hot water of 70-75°C. The slices of uncured cheese are mixed in the basket until it a homogeneity paste is produced. The resulting paste is processed and introduced in special shapes, obtaining cured cheese. After having been dried in air, the obtained cheese is ripened in certain forms at a relative humidity of the air of 83-86% and a temperature of 14-18°C.

For accelerating the ripening process the starter culture DI-PROX M 227 was used provided by Enzymes@Derivates Romania company. The culture used presents a high proteolytic activity and contains pure species of *Lactococcus lactis subsp.lactis* and *subsp.cremoris*. The addition of starter culture was carried out after cooling pasteurized milk in an inoculation doze of 1 UA/100 milk liters.

As part of the experimental study the following aspects concerned us:

- The evolution of biochemical processes by pH and acidity parameters during the ripening phase of the cured cheese for the samples with and without starter

cultures addition with high proteolytic activity;

- The biochemical evolution of the ripening process of the kashaval cheese with and without starter cultures addition by monitoring pH, acidity, humidity, lipids, sodium chloride and proteins parameters;
- The sensorial analysis of the final products;

The quality assessment of the samples was performed by Romanian standards, using physical and chemical methods. Moisture content was performed by STAS 6344-88, pH by STAS 8201-82, acidity by STAS 6353-85, fat content by STAS 6352/2-87, sodium chloride by SR ISO 5943, protein by STAS 6355-89.

3. Results and discussions

The evolution of the ripening process of cured cheese was appreciated through the acidity level of cheese. The results for pH and acidity for the examined samples are shown in figures 1 and 2.

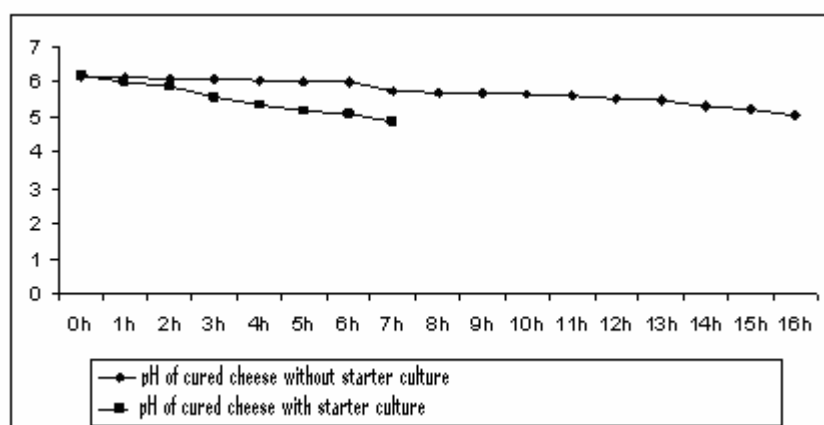


Figure 1. The evolution of pH for the two types of cured cheese

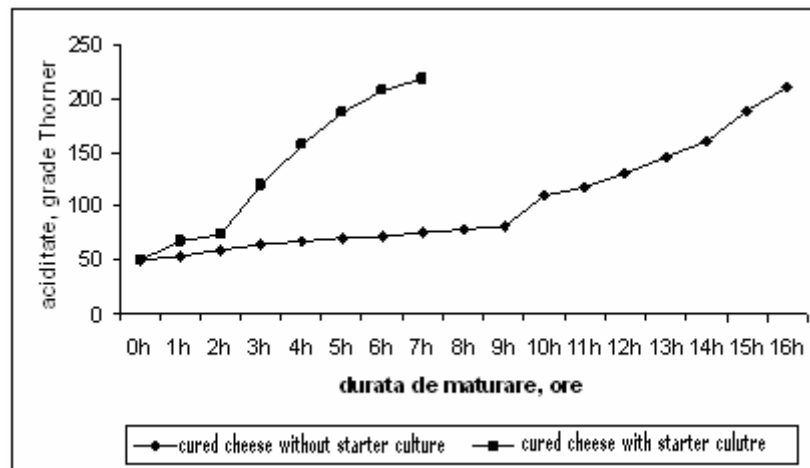


Figure 2. The evolution of acidity for the two types of cured cheese

The graphics show that the acidity for the two types of cured cheese is correlated with pH. This fact is accountable because during the ripening process take place the lactose fermentation in lactic acid by the lactic bacterium from the milk and starter culture. It is a common fact in specialty literature that final pH value for cured cheese must be around 5,1...4,8 [1,2]. That is why, for the cheese with starter cultures the ripening was stopped after a period of seven days when it reached the optimum value of pH. Consequently, the use of DI-PROX M 227 culture in manufacturing the kashaval cheese reduced the ripening time of cured cheese half way, and so the process of

getting to the final product has been accelerated.

During the kashaval cheese ripening, the lactic fermentation stops and a progressive decrease of acidity occurs as it can be seen in figures 3 and 4. From the figures we may see that cheese acidity decreases much more in the case of starter cultures added with high proteolytic activity (23,5% compared to 13,2% of the witness sample). This fact is explicable, because acidity is strongly collided with amino acids, peptides and hydrolysable macro peptides resulted under the advanced proteolysis induced by the starter culture added.

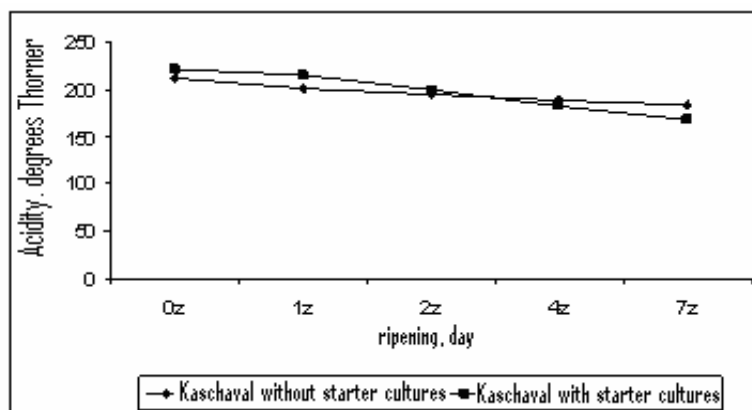


Figure 3. The evolution of acidity for the two types of kashaval cheese

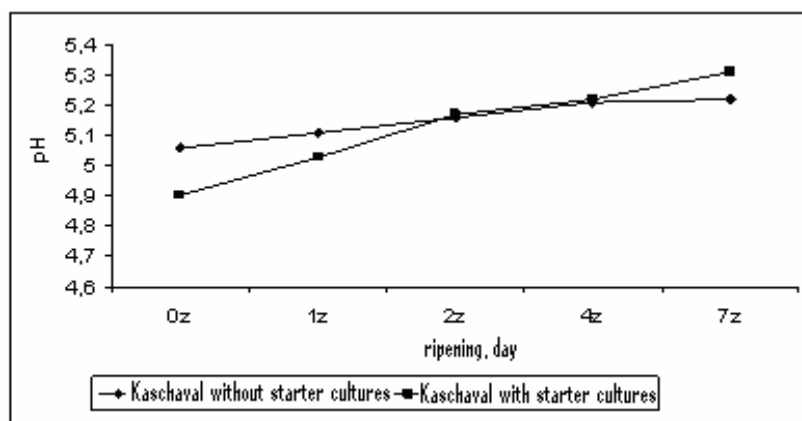


Figure 4. The evolution of pH for the two types of kashaval cheese

From the point of view of biochemical processes which occur in the kashaval cheese during ripening we notice according to the dates of the table 1 a decrease of the ripening process

intensity because of the partial inactivity of the lactic bacteria and enzymes through the scalding operation of cheese.

Table 1. The evolution of the biochemical parameters during the ripening process for the two types of kashaval cheese

Characteristics	Cured cheese without strater cultures	Kashaval cheese without starter cultures	Cured cheese with strater cultures	Kashaval cheese with starter cultures
Umidity %	47,8	43,1	47,2	41,8
Fat content %	46,9	42,1	47	40,9
Sodium chloride, %	-	2.93	-	2.1
Protein content, %	15,03	17,22 (at 7 days)	15.97	20,02 (at 7 days)

The decrease of cheese humidity during ripening as shown in table 1, is due to the water losses by salting, proteins hydrolyses at peptides and amino acids and triglycerides hydrolyses at glycerol and fatty acids, the hydrolyses of each transformation requiring a water molecule. At a significant proteolysis in the kashaval cheese during ripening process (in the case of starter cultures with high proteolysis activity), the unbound water content decrease.

The lipid content from the kashaval cheese (figure 3) is important for the formation and

perception of the flavor. As in all types of food with a great content of lipids, the lipid content in kashaval cheese can suffer damages through lypolitic process (enzymatic) or oxidative (chemical). The oxidation degree of lipids in cheese is limited; probably because of the low redo potential of the kashaval cheese and the presence of natural anti-oxidants. The fat acids released through lipase contributes directly at the forming of flavor, especially when the very mature cheese has an well-balanced content in ripening products.

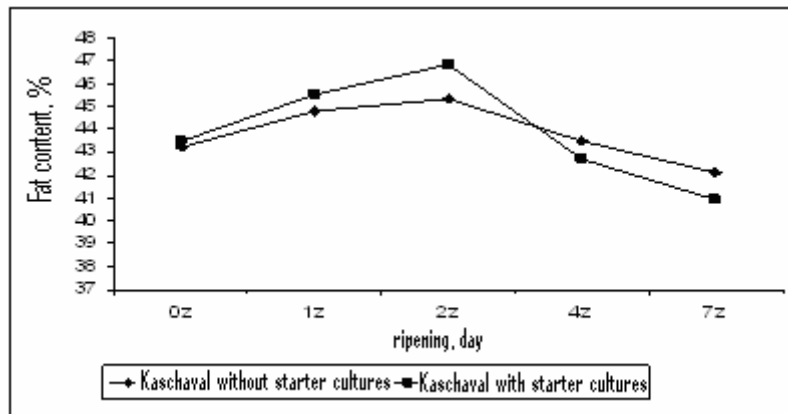


Figure 3. The evolution of lipid content for the two type of kashaval cheese

Although they present a reduced lipolitical activity, the lactococcus bacteria will hydrolyze the lipid content from the kashaval cheese in a great percent, if it will be present for a long period of time (like ripening). For that reason, the final lipid content in the kashaval cheese with starter

culture will be after seven days of ripening, with 2,8% less than in the witness sample.

From the point of view of the quantity and quality transformations of azoth substances, the relative proportions of the main components change continuously (figure 4), reported to the protein content and dry substance.

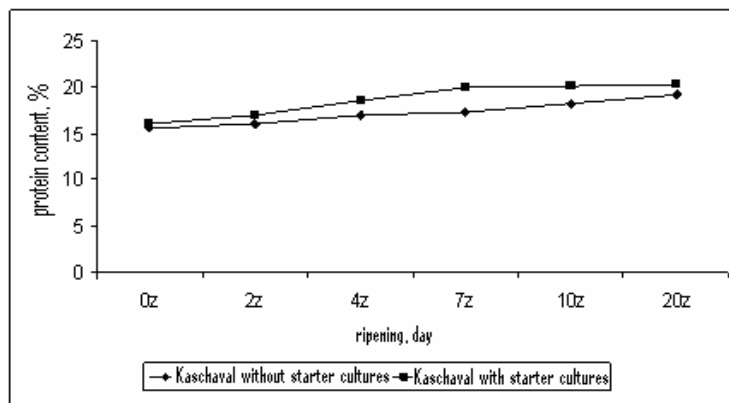


Figure 4. The evolution of protein content for the two type of kashaval cheese

A quantity increase is to be noticed for both variants, with acceleration for the sample to which starter culture was added in the technological process.

In the first seven days of ripening, the increase of protein content was significant in the case of starter culture addition, which indicates a greater activity of end peptidases from the kashaval cheese microflora because of the proteolysis induced by the added culture. It can be ascertained that

the ripening period is shorter than the one of the variant with starter culture added, the kashaval cheese being obtained according to the standard process after only seven days of ripening.

From a sensorial point of view, a significant enhancement was found (regarding the structure, consistency, taste and flavor of the ripped kashaval cheese) for the sample with starter culture addition with high proteolysis activity (figure 5).

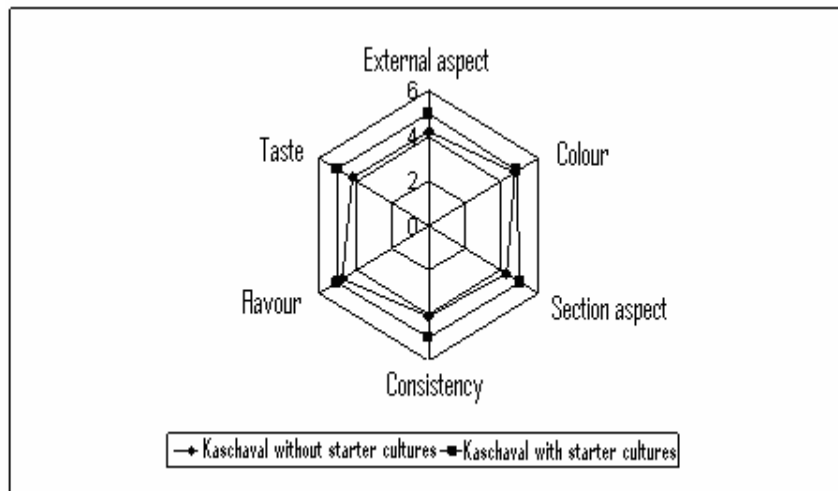


Figure 5. The sensorial evaluation for the two type of kashaval cheese

4. Conclusions

In conclusion, for reaching of the optimum ripening degree of cured cheese there were necessary seven days of ripening for the sample with addition of starter cultures with high proteolyses activity compared to sixteen hours of ripening in the witness sample case. Also, while ripening the kashaval cheese the characteristics of quality established by the standard process were reached after seven days in the case of addition with starter culture compared to ten days of ripening in the case of the witness sample.

We can make a certain statement that the kashaval cheese resulted from starter cultures is much more economical, because the time of cheese processing is very much shortened and consequently, the payments of the company are reduced.

During kashaval cheese ripening the proteolytic and lipolythic activity induced by the starter culture added has a major role in products flavor and taste, the final sample being qualitatively superior to the witness samples (without exogenous addition of starter cultures).

Acknowledgements

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