

INFLUENCE OF STARTER CULTURES ON FAT CONTENT DYNAMICS IN PRODUCTION OF WHITE BRINED CHEESE¹

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ABSTRACT

White brined cheese is a specific dairy product for Balkan Peninsula countries, Mediterranean, North Africa, Eastern Europe and some parts of Asia. The survey was conducted in 2015 at a dairy industry laboratory in R. of Macedonia. In this research work the influence of three different starter cultures of three white brined cheese variants (A, B, C) has been examined regarding the fat content dynamics. The starter culture in variant A (SMCH - 5) contained following bacteria strains: *Lb. bulgaricus*, *Str. thermophilus* and *Lb. acidophilus*. In the variant B (Choozit Feta A) the follow bacteria strains were included: *Lac. lactis* ssp. *lactis*, *Lac. lactis* ssp. *cremoris*, *Str. thermophilus*, *Lb. bulgaricus* and *Lb. helveticus*. The variant C (MOTC 092 EE) was a combination of the strains: *Lac. lactis* ssp. *lactis*, *Str. thermophilus*, *Lb. bulgaricus*, *Lb. helveticus* and *Lb. casei*. The impact of the above mentioned three different starter cultures was determined over the fat content during the process of ripening of the white brined cheese. Finally, significant impact in the obtained values about the fat content during the 60 days of ripening process has not been found.

Key words: white – brined cheese, starter cultures, fat content, dynamic.

INTRODUCTION

White brined cheese has a great tradition in R. Macedonia and is usually produced from cow milk. The increased consumption of white brined cheese

¹ original scientific paper

contributes to the necessity to be produced in almost all dairy facilities in industrial way: milk pasteurization, adding ingredients (calcium chloride, color, rennet.), and also the addition of starter cultures for continuous milk acid fermentation.

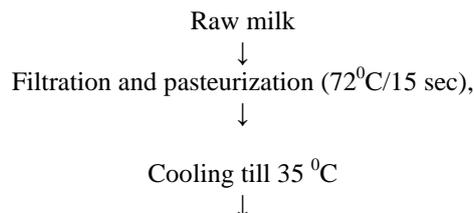
According to El Soda et al. (2003), the use of commercial starter cultures in an industrial way of cheese production is necessary for obtaining a final product with a standard identifiable feature.

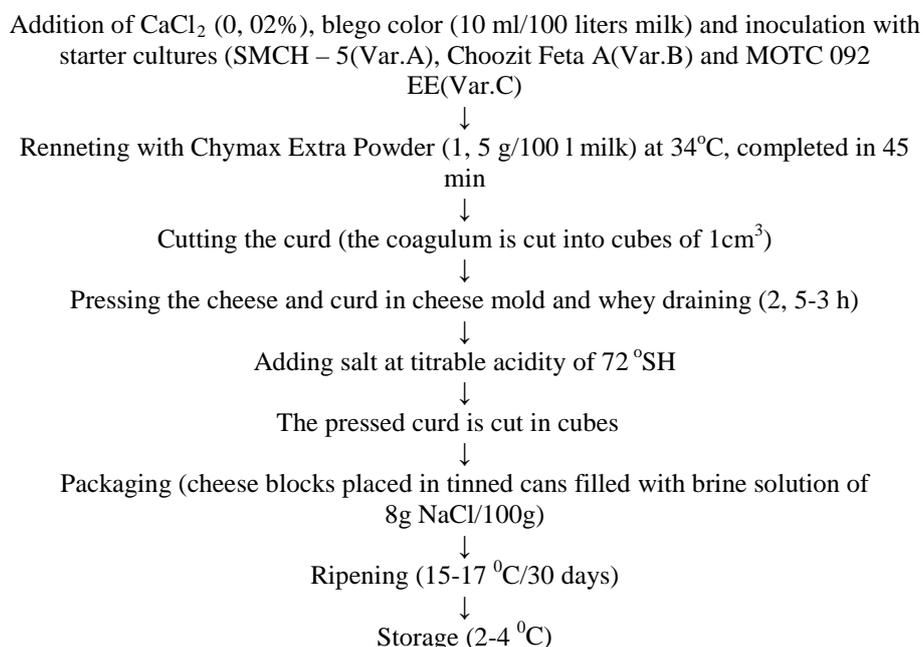
The most important function of the starter cultures is the production of lactic acid and the release of enzymes during the fermentation process of white brined cheese (Leroy and de Vuyst, 2004).

MATERIAL AND METHODS

As for this research the white brined cheese was manufactured from pasteurized cow milk in a local dairy plant "Milkom" - v. Nogaevci, Gradsko, R. Macedonia. Regarding the production the raw milk was supplied from Gradsko region in Macedonia. The chemical composition of the milk used for the manufacturing of white cheese was 12.13% total solids, 3.70% fat, 3.21% protein, 0.67% ash, and 4.55% lactose. The pH of the milk was 6.49 and it was pasteurized at 72°C for 15 seconds and cooled at 34°C. The curding was done at temperature of 34 °C. First the following starter cultures were added: for white brined cheese-Variant A- SMCH – 5, for white brined cheese-Variant B- Choozit Feta A and for white brined cheese Variant C - MOTC 092 EE. Then the CaCl₂ 0.02% and blego color 10 ml/100 liters milk was added. The cow milk was coagulated with chymosin rennet (Chymax Extra Powder 1, 5 g/100 l milk) completed in 45 min. Further on, the curd was cut in cubes of 1 cm³, resting for 5 minutes and afterwards pressed in cheese mold for 3 hours. Cheese blocks were placed in tinned cans filled with brine solution of 8g NaCl/100g. During the ripening period of 30 days the cheese was held at 15-17°C, and then kept at 2-4°C. (Figure 1 White-brined cheese technology).

Figure 1: Modified protocol of white cheese production (Ozcan et al.2012)





In order to determine their influence on fat content in white brined cheese three different types of starter cultures were used. There were three variants of cheese produced which differ by starter cultures used in production process (Var. A - SMCH – 5, product by LB Lactis – Bulgaria, Var. B- Choozit Feta A- product by Danisco - Denmark and Var.C MOTC 092 EE (produced by Sacco Clerici).

The determination of the content of milk fat in cheese is determined by the Gerber method (Caric at al. 2002). The determination of milk fat content of white brined cheese was examined on the 1st day, 10th day, 30th day and the 60th day. Further on, the standard statistical method (Najchevska, 2002) was used for statistical presentation of the analyzed data as well as the F-test for analysis of the variance in tested cheese variants.

RESULTS AND DISCUSSION

Milk fat remains incorporated between the protein matrix and the curd, although a very small part is eliminated through the whey after cutting and pressing the curd.

Milk fats influence rheological and sensory characteristics of white brined cheese. The greater amount of milk fat helps generate white brined

cheese with softer consistency and better sensory properties, unlike the low fat milk percentage which helps generate white brined cheese with hard consistency and its sensory properties are less expressed.

The fat content regarding the examined three varieties of white brined cheese is presented in Table 1, 2 and 3, and in Chart 1. According to the results depicted in Tables 1, 2 and 3, it can be concluded that fat content in the white brined cheese (var. A, var. B and var. C) at the first day of production was the following: 20,96% (var. A); 21,36% (var. B) и 21,32% (var. C).

Significant changes regarding the further period of ripening have not been registered which is shown in the graph bellow.

Continuous increase of fat content was noticed to all examined variants of white brined cheese (var. A var. B and var. C) without significant peaks. After 60 days of ripening period, Variant A had shown 22,40% of fat content, Variant B had shown 22,42% of fat content and Variant C had shown 22,34% of fat content.

Table 1. Fat content dynamics in white brined cheese -Variant A

| Variant A (SMCH - 5) | | | | |
|----------------------|-------|--------|--------|--------|
| Day | 1 day | 10 day | 30 day | 60 day |
| \bar{x} | 20,96 | 21,48 | 22,02 | 22,40 |
| Min | 20,60 | 21 | 21,70 | 22,10 |
| Max | 21,20 | 21,70 | 22,30 | 22,60 |
| Sd | 0,230 | 0,295 | 0,239 | 0,187 |
| Cv | 1,098 | 1,373 | 1,084 | 0,835 |

Table 2. Fat content dynamics in white brined cheese -Variant B

| Variant B (Choozit Feta A) | | | | |
|----------------------------|-------|--------|--------|--------|
| Day | 1 day | 10 day | 30 day | 60 day |
| \bar{x} | 21,36 | 21,84 | 22 | 22,42 |
| Min | 21,20 | 21,60 | 21,80 | 22,20 |
| Max | 21,60 | 22,10 | 22,20 | 22,60 |
| Sd | 0,167 | 0,207 | 0,187 | 0,148 |
| Cv | 0,783 | 0,949 | 0,850 | 0,662 |

Table 3. Fat content dynamics in white brined cheese -Variant C

| Variant C (MOTC 092 EE) | | | | |
|-------------------------|-------|--------|--------|--------|
| Day | 1 day | 10 day | 30 day | 60 day |
| \bar{x} | 21,32 | 21,80 | 21,94 | 22,34 |
| Min | 21 | 21,50 | 21,60 | 22,20 |
| Max | 21,50 | 22 | 22,20 | 22,50 |
| Sd | 0,217 | 0,212 | 0,230 | 0,152 |
| Cv | 1,017 | 0,973 | 1,049 | 0,679 |

The presented data are in correlation with the conclusions of Dozet at al. (1996) emphasizing that in the production process of white brined cheese, lipolytic reactions are not significantly expressed which however differs for blue cheeses, where more lipolytic processes and more changes in fat content percentage are noticed.

Popović, Vranješ at al. (2011) had similar results in their study regarding the fat content in Sjenichko cheese. They have determined that the average of fat content was 22, 97% (minimum 21.97% and maximum 23.97% of fat content) which appears as similar to the results presented in this paper. Starter cultures do not have any impact on the fat content dynamics in white brined cheese which can be confirmed by the uniform values among the three varieties of cheese. This conclusion is also confirmed by Radulović at al. (2010).

There are differences if comparing the results of this paper and the one provided by Bojanic, Rasovic at al.(2010) intended for fat content in white brined cheese. The latter have presented particularly higher level of fat content (23,86%) in which as a conclusion has been pointed out that this high percentage in Montenegro white brined cheese comes as a result of the type and race of the cows, food, physiological condition of the animal etc.

The results presented in this survey are quite similar to the results provided by Chomakov at al. (2000). Their values for fat content in white brined cheese are in the range limits of 21-25%.

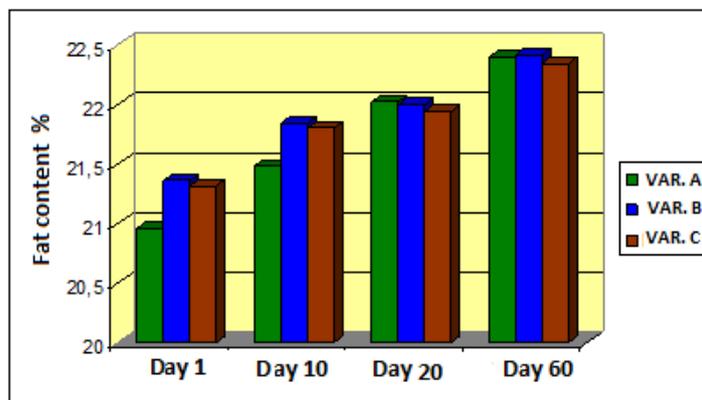


Chart 1: Fat content dynamics in white brined cheese

The increase of fat content in white brined cheese from this survey is also followed by increase of the dry fat matter content. The energy value of cheese mostly depends on the fat content. It is of a great importance that the milk during the industrial production should not be transported in long lines, causing increased fat loss, which in total will effect on product amount.

With the use of Fisher's-test statistically significant differences among the tested varieties were not determined, so it can be concluded that the starter cultures do not affect the fat content in white brined cheese.

CONCLUSION

Significant differences in the content of milk fat during the fermentation process among all three white brined cheese variants (A, B and C) produced by different types of starter cultures have not been found. According to the analyzed data it can be confirmed and concluded that starter cultures do not influence the content of milk fat during the process of fermentation of white brined cheese.

The content of milk fat was presented such as: 22.34 % (variant C), 22.40% (Variant A) to 22.42% (variant B).

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