MICROBIOLOGICAL ASSESSMENT OF SHARRI CHEESE PRODUCED UNDER TRADITIONAL AND INDUSTRIAL CONDITIONS

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Abstract

Sharri cheese is produced from sheep milk. The production of this cheese is an early tradition in the region of Sharri. The traditional from is produced from unpasteurized milk. Recently, this type of cheese is produced in industrial conditions. The purpose of this paper is to evaluate and compare the microbiological situation of Sharri cheese, produced in traditional and in industrial conditions. Throughout this study, we have investigated the effect of some physical and chemical parameters upon on *Staphylococcus coagulase positive* and aerob mesophilic bacteria. in Sharri cheese. Considering that *Staphylococcus coagulase positive* is able to produce enterotoxines, samples have been analysed for the presence of toxins – VIDAS.

Keywords: Sharri cheese, unpasteurized milk, traditional cheese, industrial cheese, *Staphylococcus coagolaso positive*, staphylococcus enterotoxines

Introduction

   *Staphylococcal foodborne intoxica*tion, occurs after ingestion of food contaminated with *staphylococcal enterotoxins* (SE). This intoxication involve some typical symptoms such as vomiting and diarrhoea, caused mainly from enterotoxinogenic coagulase-positive strains *of S. aureus.* Staphylococcal foodborne intoexication is reported to be one of the most

common bacterial food borne outbreak in many countries. Dairy products are considered very important in charged food because they constitute 1 – 9 % (mean 4.8 %) of *S. aureus* outbreaks in Europe. SE is considered slightly, inactivated during cheese processing, storage, or during cooking the cheese in the kitchen. Therefore, enterotoxinogenic staphylococci strains are capable to grow in cheese at a high level (more then 10^5 to 10^6 cfu/g or /ml) . The Community legislation in force for milk and milk products (Council Directive 92/46/EEC) lays down criterias for *S. au*reus in raw milk, cheese, milk powder and frozen milk products.

Cheese is a good substrate for growth of *S. aureus*. Such product is involved in food borne diseases due to: the occurrence of coagulase-positive staphylococci in raw milk; cross-contamination during the process; the possible cross-contamination thereafter (Balaban et.al.2000). However, the number of *S. aureus* is not always a good indicator for the presence of staphylococcal enterotoxins in milk product. As *staphylococcal enterotoxins* are heat stable, they may be present in food when *S. aureus* are absent (Bergdoll, 1970). Moreover, not all strains of *S. aureus* are enterotoxigenic. Therefore, a conclusive staphylococcal food poisoning diagnosis is mainly based on the detection of *staphylococcal enterotoxins* in food. Unpasteurized milk and cheese are typical dairy products often charged as the cause of foodborne outbreaks from *staphylococcal enterotoxins* (SE) (Sutherland et al., 1994). The symptoms for SE intoxication include nausea, vomiting, abdominal pain and diarrhea, but not rare they are accompanied with headache and blood pressure drop. The processing of foods such as heating, can reduce the presence of   *S. aureus* but it is necessary to take in consideration that the number of S. aureus colony count is not a real indicator hazard because the toxins are much more heat tolerant than *S. aureus* (Morris et al., 1972). Such situations may require testing for SE, which is expensive. While this may be justifiable in cases of foodborne intoxication, it may be not essential for routine quality control purposes. Screening food for thermonuclease (TNase) as an indicator of staphylococcal growth at high levels can be another appropriate alternative (Ono et al., 2008).

Table 1: Factors affecting growth and enterotoxin production by *S. aureus* (Tatini, 1973; Crowther and Holbrook, 1980; Baird-Parker, 1990; ICMSF, 1996)

	Organism growth		SE production	
Factor	Optimum	Rrange	Optimum	Rrange
Temperature	37	7-48	40-45	10-48
pH	6-7	4-10	7-8	4-9.6
Water activity (a_w)	0.98	0.83- >0.991	0.98	0.85->0.992
NaCl (%)	0	0-20	0	0-10
Atmosphere	Aerobic	Anaerobic-aerobic	Aerobic (5-20% dissolved O_2)	Anaerobic – aerobic

1   Aerobic (anaerobic 0.90 – > 0.99)
2   Anaerobic (anaerobic 0.92 – > 0.99)

Materials and methods

The samples are taken from the milk for the traditional and industrial produced cheese. The samples are taken through the process of manifacturing and ripening. Analyses were carried out at the Institute of Public Health in Skopje and the Faculty of Food Technology and Nutrition in Gostivar. The analyzed parameters are:

In this study we have aimed to compare cheese produced in traditional and industrial conditions, by the same milk (the same farmer). Industrial cheese produced from milk samples collected from different farmers, is analyzed simultaneously. For each form of production received five samples. Follow the entire process of production from fresh milk by the end of maturity. The entire process of production from fresh milk by the end of maturity is followed.

Results and discussion

From the data of the analysis presented in Figure 1, 2, 3 and 4 the number of aerobe mesophylic bacteria and staphylococcus coagolaso positive is much higher in milk collected from different farmers compared to the milk that is obtained by the same farmer.

To compare the effect of fermentation studied microorganisms the samples were kept in the same environmental conditions (relative humidity, temperature).

As determined by the graphical presentation (chart No. 1 and 2) of aerobe mesophylic bacteria have the logarithmic growth phase longer than positive staphylococcus coagolaso positive.

pH decline respectively fermentation process is faster in the samples of traditional cheese compared to the other two forms, even though tht in industrial forms of lactic acid used in the preparation of brine Figure 3.

Water activity has a faster decline in the samples of cheese produced in industrial conditions (75), traditional cheese samples has a similar decline of the water activity with the sample 75, meanwhile the sample 85 in the beginning of the process ha a slower decrease which is associated with the very slow fermentation of this sample chart 4.
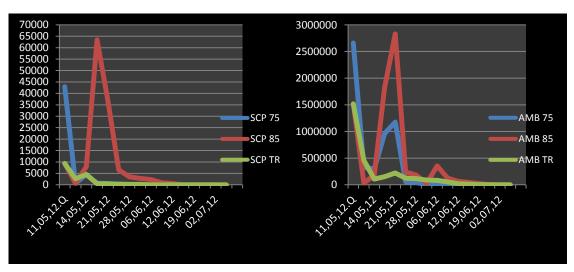
In Figure 5 and 6 are shown the results on the relative humidity and the temperature in the warm room and cold fermentation room. According to the technological process Sharri cheese production in warm room relative humidity should not exceed 85% and the temperature 14-18 ° C. The fermentation cold room should have the same level of relative humidity with warm fermentation room and ambient temperature 4-8 ° C.
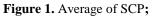
Till 27.05.2012 the samples from traditionally produced cheese and the industrial produced cheese 75 were in the warm fermentation room and were inserted into the cold room with these acidity parameters:
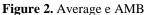
- Traditional cheese 78°SH
- Industrial cheese 75 60 °SH

In Figure 1 and 2 is shown the average staphylococcus coagolaso positive where their number has a logarithmic growth till the date 14.05.2012 and thereafter there is a rapid decrease. Meanwhile in the samples prepared in industrial conditions 85 due to fermentation problems that are reflected in Figure 3, the logarithmic phase of growth is longer till 17.05,2012 which achieve maximum value for aerobe mesophylic bacteria to 63,450 cfu / gr. The data presented in Figure 2 show that aerobic bacteria mezofile have a longer period of logarithmic growth until 21.05,2012, noting a larger increase in traditional samples in comparison with the two other samples.

Samples were analyzed for the presence of staphylococcus enterotoxins - Vidas, from the results of the analysis no sample was positive in all three forms of production.

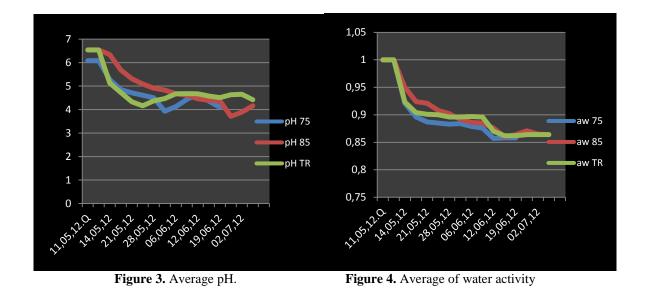**Figure 1.** Average of SCP**;**   **Figure 2.** Average e AMB

In Figure 3 are presented pH values. Noted that the decrease of pH value is faster than traditional samples to industrial. The decrease of pH value in the critical period when the phase of logarithmic growth of microorganisms occurs (from 11.05.2012 up to 05.21.2012) decreases in these values respectively:

- For traditional samples from 6,54 to 4,73
- For industrial samples 75 from 6,08 to 4,71 dhe
- For industrial samples 85 from 6,54 to 5,31

Figure 3. Average pH.　　　　　　**Figure 4.** Average of water activity

In Figure 5 is reflected the ambient temperature and relative humidity in the warm room fermentation where we can see that generally ambient temperature exceeds 18 ° C maximum limits specified in the technological process during the production of this type of cheese.
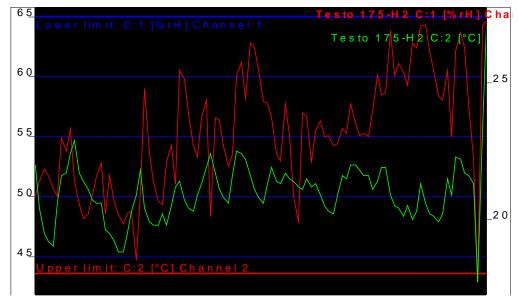

Figure 5. Relative humidity and ambient temperature during cheese maturation in warm room

In Figure 6 is reflected the ambient temperature and relative humidity in the could room fermentation, in general ambient temperature during this period to maturity is below the specified maximum 8ºC. With the exception of the period 01.06.2012 to 19.06.2012 where the temperature exceeds 8 ºC
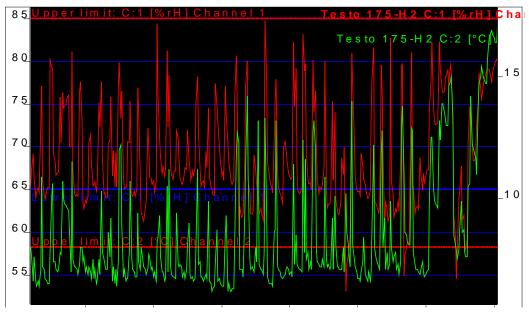
Figure 6. Relative humidity and ambient temperature during cheese maturation in cold room

Conclusion

From the analysis data of this study we can conclude:

- Although Sharri traditional cheese is produced from unpasteurized milk it fulfills the security requirements for microorganisms to consider;

- The fermentation process is faster compared to the industrial form even though the industrial form the lactic acid is used in the preparation of brine;

- the traditional forms of production of this cheese should be stimulated;

- In the traditional form the transport as a factor that affects the quality of raw materials is eliminated;

- The hygiene during sheep milking and manipulation of the milk during cheese production should be improved;

- Lactic acid bacteria being in the natural environment have higher activity fermenting.

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The following abbreviations mean:

TR - Traditional cheese

85 - Industrial cheese pasteurized at the 85 °C

75 - Industrial cheese pasteurized at the 75 °C