

EVALUATION OF THE QUALITY AND TYPICALITY OF TWO TYPES OF COW 'S MILK CHEESES

EVALUARE A CALITĂȚII ȘI CARACTERISTICILOR LA DOUĂ SORTIMENTE DE BRÂNZĂ DE VACĂ

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ABSTRACT | REZUMAT

Besides modern methods based on chemical treatment, which included the use of acids such as propionic acid or sorbic acid and its salts to limit the growth of fungi and bacteria, some traditional methods of cheese preservation, such as salting and freezing, are still used nowadays. The goal of this study was to compare fresh cheese and cheese preserved by salting and freezing from a physicochemical, microbiological, and organoleptic point of view. In this study, the cheese types were obtained from milk from two different breeds: Romanian Bălțata and Red Holstein. Physicochemical examinations determined the water content, dry matter, fat, protein, peroxide value, and the microbiological examination analysed the presence or absence of *E. coli* bacteria. The study's results indicated that both kinds of cheese had similar compositional values, and the microbiological examination revealed the presence of *E. coli* in both cheeses, with an excess of its value only in fresh cottage cheese from Red Holstein cows. The microbial activity in both varieties of cheese disappeared after 3 months of preservation, both in the case of preservation by freezing and salting. According to the organoleptic examination of the two types of cheese, the respondents preferred the cheese made from Romanian Bălțata cow milk.

Keywords: cheese, preservation, freezing, organoleptic qualities, salting

Pe lângă metodele moderne bazate pe tratament chimic, ce presupune utilizarea unor acizi, precum acidul propionic sau acidul sorbic și sărurile sale, cu efect de inhibare a creșterii ciupercilor și bacteriilor, astăzi sunt utilizate și unele metode tradiționale de conservare a brânzeturilor, și anume sărarea și congelarea. Scopul acestui studiu a fost de a compara din punct de vedere fizico-chimic, microbiologic și organoleptic brânza proaspătă și brânza conservată prin sărare și congelare. Tipurile de brânză luate în studiu au fost obținute din lapte de vacă de la două rase diferite: Bălțata Românească, respectiv Red Holstein. Prin examenele fizico-chimice s-a determinat cantitatea de apă, substanța uscată, grăsimea, proteina și gradul indicelui peroxid, iar prin examen microbiologic a fost analizată prezența sau absența bacteriei *E. coli*. Rezultatele studiului indică valori apropiate din punct de vedere compozițional la ambele sortimente de brânză, iar la examenul microbiologic a fost identificată prezența de *E. coli* în ambele sortimente de brânză cu o depășire a valorii acestuia doar în cazul brânzei proaspete de vacă provenită din lapte de la vacile din rasa Red Holstein. Încărcătura microbiană din ambele sortimente de brânză dispăre după 3 luni de conservare, atât în cazul conservării prin congelare, cât și în cazul conservării prin sărare. Analiza organoleptică a celor două sortimente de brânză indică o preferință a respondenților față de brânza de vacă obținută din lapte de la vaci din rasa Bălțată Românească.

Cuvinte cheie: brânză, conservare, congelare, calități organoleptice, sărare

Cheese is the oldest food in human history, dating back to 7000 BC. It is now consumed in large quantities throughout the world, with an average consumption of 20 kg / year in European countries (7). This increase in cheese consumption is due to its composition rich in nutritional components, so became a

very important source of protein, minerals, vitamins, and short-chain fatty acids so necessary for people's daily diet. As a result of this significant evolution, the cheese industry plays a critical role in promoting the quality and safety of these products, especially increased shelf life (6,10). The extremely wide range of ingredients and their use in the cheese processing process, to which were added processing parameters (temperature and handling techniques) and the product microflora, have made it possible today to identi-

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fy more than 1000 cheese types worldwide through multiple methods of determination (5).

Although processed cheese is considered to be a fairly stable food product with a relatively long shelf life, there is still a risk in this area. Degradation occurs as a result of exposure to various factors such as light, heat, transition metal ions, oxygen, and enzymes, especially in lipids, resulting in the formation of hydroperoxides, which can easily react with fatty acids, finally resulting in the formation of oxidative secondary products, particularly aldehydes, which are responsible for food rancidity (3). For this reason, it was very important to choose the best method of preserving the cheese, being the only way to avoid quick degradation of the product. Although it dates back to prehistoric times, the use of salt (NaCl) in the preservation of cheese is still one of the most used methods today. This method has several major functions, namely: it provides the necessary intake of sodium (Na) to each person (3-5 g Na / day), has control in enzymatic activity, microbial growth and biochemical changes during ripening, but not lastly, it contributes to the flavor of the product (8,9). Even if freezing is a classic method, it could not be used as needed due to a lack of refrigeration system development, but thanks to modern technologies, freezing is now an excellent method of preserving and supplying consumer demands (4). Given the fact that this method was widely used, studies revealed that microstructural changes in the casein matrix occurred after forming ice crystals during storage and affected some sensory properties. All of these changes were caused by protein dehydration, which occurred as a result of water migration at the microscopic level, which was influenced by humidity, dissolved substances, and temperature (1).

MATERIAL AND METHODS

The research design was performed using round-shape cheese. Were used 12 round-shaped pieces of cheese, 6 kg each, 6 pieces of cheese were obtained from Romanian Bălțata cow's milk and 6 pieces of cheese from Holstein Red cow's milk. The food preference test and the methods of compositional and hygienic analysis of the products were used as working methods. Each cheese was separated into 3 equal portions of 2 kg each, with the first part consisting of compositional and organoleptic analysis of the fresh product, and the second part consisting of a compositional and organoleptic examination of the product after 3 months of freezing and from the third part the compositional and organoleptic analysis of the product were performed after preservation by salting, the cheese is kept in barrel for 3 months. Total proteins, lipids, dry matter, and water were determined for the compositional analysis, while the peroxidase index

and the *E. coli* bacteria were determined for the hygienic analysis. The food preference test was distributed to 34 people, named respondents who were chosen randomly from the USAMV Cluj campus students and employees. It was developed based on other food preference tests (16) and consists of three parts. The first part contains general data about participants such as age, sex, and origin. Part II contains data on their food preferences: if they consume dairy products; preference for a certain type of milk depending on the species: cow, sheep, goat, donkey; the reason why they prefer the type of milk mentioned above having as variants: it is healthier, it is tastier, it is easier to find or if it has been recommended by the doctor; after which they had to answer the question: if they eat cow's cheese, if they ate frozen cheese, and if the answer is yes, they must answer if they think that the cheese preserved by freezing has lost its organoleptic qualities compared to fresh cheese, they were also asked if they had consumed barrel preserved cow's cheese, and if the answer is yes, they should answer if they believe that the cheese preserved in the barrel has lost its organoleptic qualities compared to the fresh one. The next question was about how to store cheese during the winter, with options for freezing and barrel preservation, and then we were asked which of the preservation methods described above we believe has the greatest impact on the organoleptic qualities of cheese. The third part of the study was oriented to the evaluation of products from an organoleptic perspective, using the following parameters: aspect, colour, smell, and taste (2), after which each respondent assigned a grade to each parameter analysed.

Total protein substances were determined by digesting a sample concentrated in sulfuric acid, which transforms organic nitrogen into ammonium ions under the catalytic action of copper sulphate; alkalization; and distillation of ammonia produced in excess of the boric acid solution, potentiometric titration of ammonia combined with boric acid and calculation of the nitrogen content of the sample, starting from the ammonia produced (15). To determine the fat, the butyrometric method was used to separate the fat from the sample in a butyrometer by centrifugation, after the preliminary dissolution of the protein substances with sulfuric acid, in the presence of isoamyl alcohol (13). The water content and dry matter were determined using a method that is based on calculating mass loss by heating at a predetermined temperature, up to a constant mass, under prescribed conditions, depending on the nature of the product (14). In order to determine the number of coliform bacteria, the method of seeding 3 test tubes with selective concentrated enrichment medium double liquid and the single liquid was used, with a determined amount of sample for analysis if the product is liquid or

with a determined amount of dilution, by successive decimal dilutions, in the case of other products, followed by incubation of the test tubes at 35 ° or 37 °C for 24-48 hours, and examination of the test tubes for the assessment of gas production in the Durham tubes (12). The Hanus method was used to calculate the iodine value, which is a criterion for determining the authenticity of fats and represents the quantity of iodine added to the double bonds of fatty acids in 100 g of product. In the presence of starch, the fat dissolved in chloroform adds iodine monobromide to the double bonds, the excess bromine iodide releases the iodine from the potassium iodide, and the solution is titrated with sodium thiosulphate.

RESULTS AND DISCUSSIONS

Out of the total of 34 respondents, 26 persons, representing 76.47% are female and 8 persons representing 23.52% are male. The vast majority of respondents (31) spend most of their time of the year (min. 7 months) in rural areas, representing 83.87% and only 3 respondents live in urban areas. The predominant age group of respondents is between 18 and 24 years (26 people) representing 76.47%, followed by the age group between 25-30 years (4 people) representing 11.76% and the age groups 31-40 years and 41-60 years (2 people each) representing 5.88%. All 34 survey respondents consume dairy products, 27 of them consume mainly cow's milk, 2 mainly consume sheep's milk, one goat's milk, one person consumes cow's, sheep's and goat's milk, 2 people consume cow's and sheep's milk and a person cow's and goat's milk. None of the respondents mentioned consuming donkey milk. The majority of those who preferred cow's milk said so because "it is tastier," and the second reason was that "it is easier to find." Regarding the use of cow's cheese products, 33 of the 34 respondents claimed that they normally consume this product, with only one person claiming that they are not used to consuming cheese. Also, 20 of the respondents said that they consumed cow's cheese preserved by freezing, and 5 of them also consumed cow's cheese preserved by salting; Of the 14 respondents who said they did not eat frozen preserved cow's cheese, 6 also consumed salted preserved cow's cheese. Out of 20 respondents who declared that they had consumed cow's cheese preserved by freezing, 13 reported a decrease in organoleptic characteristics, while only seven reported no decrease in organoleptic qualities. Of the 11 respondents who specified that they also consumed cow's cheese preserved by salted in the barrel, only 2 said that it showed a decrease in organoleptic qualities and 9 said that it did not show a decrease in organoleptic qualities. A total of 25 respondents said that they prefer to preserve cheese over

the winter by freezing, although only 16 of them believe that this method does not decrease the product's organoleptic properties and 9 of them, while preferring to freeze the cheese as a preservation method, believe that salting does not affect the product's organoleptic characteristics. Only 9 respondents chose salting by keeping in barrels as a method of preservation, saying that this procedure does not decrease the organoleptic aspects of the product. In terms of appearance, colour, smell, and taste, the cheese obtained from Romanian Bălțata cow's milk is more pleasant than the cheese obtained from Red Holstein cow's milk, according to the organoleptic analysis of the two fresh products. This difference can be justified, at least in terms of flavour, because the product contains a high number of coliform bacteria colonies that made it taste pungent.

In terms of appearance, colour, smell, and taste, the organoleptic examination of the two products preserved by freezing identifies both varieties of cheese as equally pleasant, both the cheese made from Romanian Bălțata cow's milk and the cheese made from Red Holstein's cow's milk. The organoleptic analysis of the two products preserved by salting and kept in barrels qualifies more pleasantly the cheese product obtained from Romanian Bălțata cow's milk in terms of appearance, colour, smell and taste than for the cheese product made from Red Holstein cow's milk.

We can see that the value of proteins in cheese made from Romanian Bălțata cow's milk has decreased based on the interpretation of the results of the compositional analyses in fresh and preserved form after preservation by freezing and remained unchanged after preservation in the barrel, while for cheese made from Red Holstein cow's milk the value of protein increased after preservation in both methods. Regarding the dry matter for cheese obtained from Romanian Bălțata cow's milk, the value increased in both preservation methods with a visibly greater difference for cheese preserved in barrels. The same growth aspect is found in cheese obtained from Red Holstein cow's milk, especially by preservation in barrels. In the case of fats for cheese obtained from Romanian Bălțata cow's milk, the value decreased when preserved by freezing and increased when preserved in barrels, while for cheese made from Red Holstein milk the values increased for both methods of preservation but more significantly for preservation in barrels. The water content in cheese made from Romanian Bălțata cow's milk decreased in both preservation procedures, with a significant difference in preservation in barrels. The same aspect of decrease is found in cheese obtained from Red Holstein cow's milk, especially in preservation by salting. After preservation, the peroxidase value remained zero for both products in both preservation methods (Fig. 1).

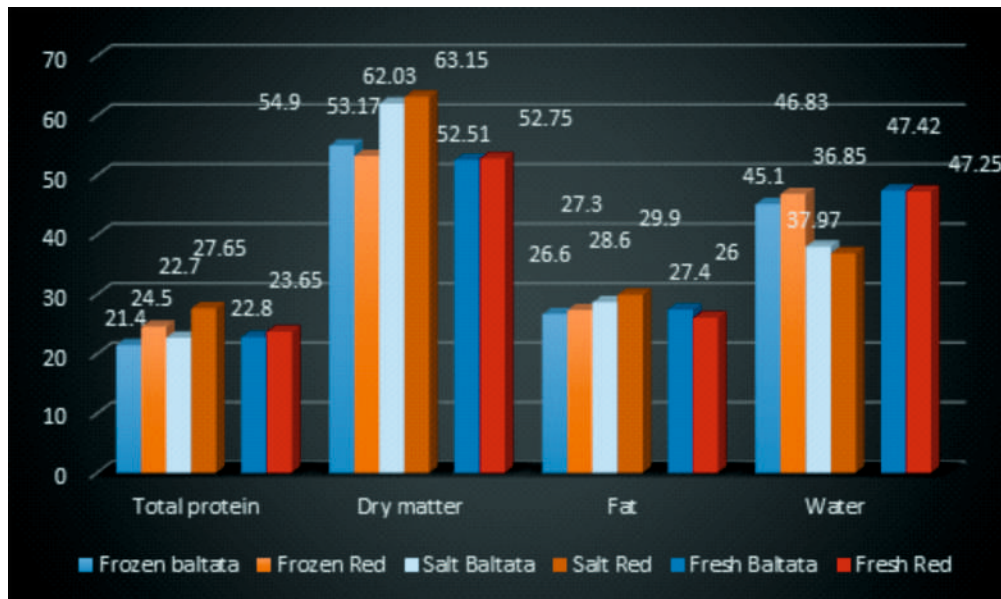


Fig. 1. Graphical representation of the differences between the compositional analysis in fresh and after preservation of the two types of cheese by freezing and salting

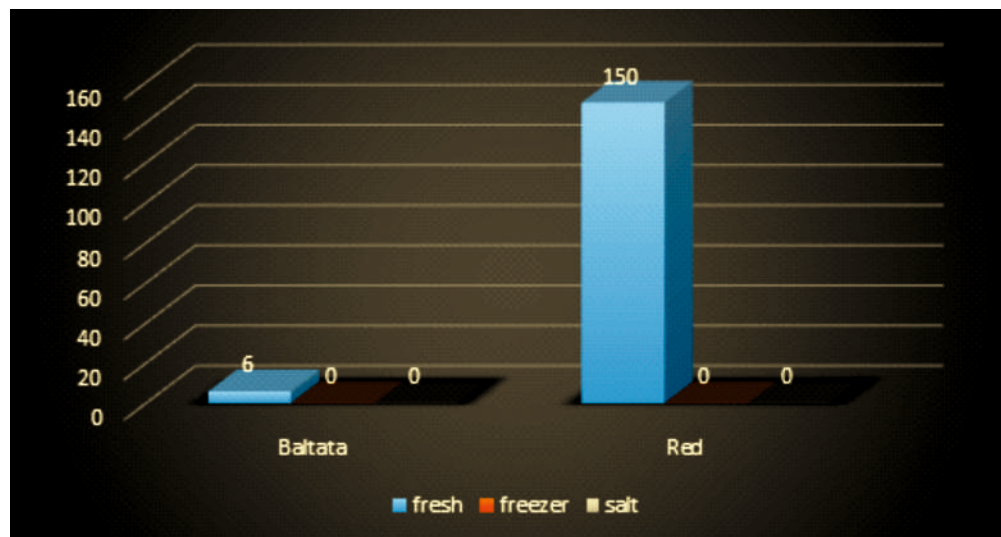


Fig. 2. Graphical representation of the differences between the analysis of the *E. coli* load in fresh and preserved cheese by freezing and salting

An important aspect is the presence of *E. coli* bacteria where after preservation both by freezing and salting the value decreased to zero with the mention that for cheese obtained from Red Holstein cow's milk the value of *E. coli* was above the maximum accepted value (Fig. 2). In a recent study, Tudor and Mitranescu (2021) showed that in most of the cheeses analysed in the commercial network there were exceedances of some microbial parameters, especially *E. coli* (11).

CONCLUSIONS

The main reason for respondents' preference for milk types is the taste and then how easy is commer-

cially available. The vast majority of respondents chose freezing as a method of preserving the cheese, although they said that this method affected the organoleptic qualities of the product. Respondents could not distinguish a fresh sample from a preserved sample. The organoleptic analysis of the two fresh products qualifies as more pleasant the cow cheese product obtained from Romanian Băltașă cow's milk in terms of appearance, colour, smell and taste compared to the cow cheese product obtained from Red Holstein cow's milk. The compositional analysis of the products indicates close values from the compositional point of view of the two varieties of cheese in terms of water, dry matter, fat, protein, and from a microbiolo-

gical point of view the analysis of the fresh product indicated the presence of *E. coli* in both kinds of cheese with an excess of in Red Holstein cow's milk cheese. After 3 months of preservation, either by freezing or salting, the microbial load disappears, having the value zero.

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