SENSORY AND PHYSICO-CHEMICAL CHARACTERISTICS OF A NEW ASSORTMENT OF CHEESE OBTAINED IN THE MILK AND MILK PRODUCTS MICRO PRODUCTION WORKSHOP WITHIN IULS

Roxana Nicoleta RAȚU[1], Alexandru USTUROI[1], Alina Narcisa POSTOLACHE[2], Marius Giorgi USTUROI[1]

e-mail: roxana.ratu@uaiasi.ro

Abstract

As more and more people place a high value on their health and well-being, taking into consideration all of the variables that contribute to it, the food business sector has been forced to enhance its goods, as the food diet plays an extremely significant part. By examining the chemical makeup of the food they consume, today's customers are paying more attention to product ethics. Additionally, sectoral considerations play a major part in the procurement of food, with the food being purchased only after doing a much more thorough study.Cheeses play a significant part in the diets of consumers, since they are a commodity that is extensively consumed both internationally and in our own country. For many years, producers have defined cheese quality as cheese that is made consistently and inexpensively. Consumers had fewer options in the past, and as a result of this limited experience, their palates were less discriminating. Today's cheese markets are global, and cheesemakers compete openly for customers, providing them with a growing variety of options. Cheese consumers are more affluent, and many have sampled or consumed a variety of cheeses regularly, making them more discriminating. These customers are now defining the cheese quality standard, which is ultimately established by eating quality. In our country, over time, many different types of cheese have appeared, but telemeau stands out among them due to a variety of characteristics, and because it is considered a traditional product. Even while the vast majority of telemea variants now available on the market are produced using a standard technology (SR 1981/2008), the primary goal of this study was to create a new assortment of cheese, which was called "A type of Telemea cheese". To emphasize the qualitative parameters, sensory analyzes were performed (appearance, consistency, color, odor, and taste), and physicochemical determinations were also performed (water content %, dry matter %, fat relative to dry matter %, protein substances %, sodium chloride % and acidity °T), values that were compared with those specific to Telemea made of fresh cow's milk (quality I).

Key words: milk, tehnology, telemea

Because milk preservation is challenging, humans have been processing the milk into more resistant products since the dawn of time. Making cheese is one of the most common ways of processing milk (Ufuk K., Goknur T., 2008; Combs, W. B. *et al*, 1924).

One of the oldest forms of produced food is cheese. Cheese-making is thought to have begun as early as 10.000 BC, when sheep and goats were first domesticated in the Middle East and early herdsmen ingested milk. Milk has a short shelf life due to infecting germs, especially in warm areas. As a result, sour milk may have naturally split into curds and whey, with the solid curd providing an edible and nourishing food (Barbara Walther *et al*, 2008; Fox P.F. *et al,* 1995).

Cheese is a fresh or ripe product obtained by coagulating milk followed by whey drainage.

The main rationale for purposefully converting milk into cheese is to preserve a perishable food and to convert it into a stable and storable product. It also expands the diversity of meals (Barbara Walther *et al*, 2008).

"The pearls in the crown of the dairy sector" are fermented dairy products with exceptional nutritional value (Kourkoutas *et al*, 2006). People's nutritional needs and demands have changed in terms of quantity and quality as their quality of life has improved.

Furthermore, cheese has a low lactose level, making it an excellent choice for persons with lactose intolerance (Monti *et al*, 2017). Currently,

[1] Iasi Uneversity of Life Science „Ion Ionescu de la Brad”, 700490, Romania
[2] Research and Development Station for Cattle Breeding Dancu, 707252, Iași, Romania

approximately 130 nations and regions make various cheeses, with global cheese production totaling nearly 2000 x 10^4 tons, with European Union countries (e.g., the Netherlands and Germany) being the world's major exporters.

Cheese made in Europe, which has a milder environment than the Middle East, needed less salting to keep it fresh. Cheese was an ideal home for a range of beneficial microorganisms and molds, which give aged cheeses their distinct and intriguing flavors, thanks to its decreased salt and acidity (Vedamuthu E.R., Washam C., 1983).

Due to its exquisite taste, cheese ranks first among Romanians' favored fundamental foods in practically all meals, whether consumed by adults or children. Everyone can enjoy a variety of cheeses, but telemeau is one of the most popular, especially in rural areas, where it can be purchased or even created at home (Roxana Nicoleta Raţu, Usturoi M.G., 2019).

Telemea's etymology is intriguing, as its name is derived from the Turkish "teleme," which means squeezed cheese sliced into rectangular pieces and stored in brine.

Telemeaua is created from a variety of milk, each of which has a distinct flavor based on the type of milk used, as well as the freshness or, to put it another way, the maturity of the milk.

There have been various variations of cheese over time, but telemeau has remained one of the most popular among Romanians for any meal because it is traditional and offers numerous health benefits for those who consume it.

Telemeaua is a fermented cheese with numerous health benefits that can be manufactured from any sort of milk. The product can be manufactured both at home and in the factory, with a significant demand on the Romanian market.

In our country, over time, many different types of cheese have appeared, but telemeau stands out among them due to a variety of characteristics, and because it is considered a traditional product. Even while the vast majority of telemea variants now available on the market are produced using standard technology (SR 1981/2008), the primary goal of this study was to create a new assortment of cheese, which was called ”A type of Telemea cheese”.

MATERIAL AND METHOD

To make the proposed product, 500 L of milk was used, of which five batches were made, using 100 L / batch each.

To obtain a good quality product, the raw material milk must be of very good quality. In the first stage, physicochemical analyzes were performed on the raw material milk, where the main physicochemical indices were followed, namely: density, pH value, water content, total dry matter, non-fat dry matter, fat content, and protein level.

The density (g/cm^3) of milk is the ratio between the weight (mass) of a volume of milk at +20°C and the weight of the same volume of water at +4°C; density assessment was performed by the areometric method, using a thermolactodensiometer (Mihaela Ivancia *et. al*., 2019). The density of the milk is variable, being at 20°C between 1,029 and 1,033.

The pH indicates the concentration of hydrogen ions in the milk. Normal milk is a weak acid product, with a pH value between 6.3 and 6.9, with an average of 6.5. In the case of the samples analyzed by us, the pH value was established with the help of a portable pH meter HANNA pHep instrument with automatic temperature compensation.

An ultrasonic milk analyzer (Ekomilk Bond) was used to determine the water content (%) of total dry matter (%), degreased dry matter (%), fat (%), and protein (%). a resonance chamber containing the test sample to measure the impedance changes of the detector sensor produced by the wavelength oscillations of the ultrasound beam, under the influence of changes in the chemical components in the sample analyzed.

In the case of the assortment analyzed by us, the technological process of milk processing took place in an open valve provided with a double jacket.

The technological steps for obtaining Telemea cheese were:

1. After the qualitative and quantitative acceptance of the milk, the milk was filtered to remove impurities.

2. The pasteurization of the milk was carried out in the valve by heating it to 61°C and keeping it at that temperature for 30 minutes *(figure 1).*

Figure 1 **Checking the pasteurization temperature**

3. The preparation of the milk for coagulation was carried out after pasteurization by cooling the milk to a temperature of 38°C at which time the mayo of selected lactic acid bacteria was added in

a proportion of 0.15% *(figure 2)*. After sowing with mayonnaise, the milk was kept at a coagulation temperature for 60 minutes, thus ensuring the development of lactic acid bacteria and the increase of acidity (El Soda M. *et al*, 2000).

Figure 2 **Mayo of selected lactic acid bacteria was added**

4. The coagulant enzyme was curdled at 33° C, ensuring a coagulation time of 71 minutes *(figure 3)*. The consistency of the curd at the end of the curd is of great importance because a soft curd leads to the formation of cheese with a soft consistency that dehydrates and is pressed hard, losing both protein and fat in whey.

Figure 3 **Coagulation stage completion test**

5. The curd was processed in the valve by cutting it with a harp in columns with a square section with a side of 2 centimeters, followed by cutting with a spoon into cubes of the same size *(figure 4)*. After resting for 30 minutes, the whey is partially removed and the curd is removed directly into the molds.

Figure 4 **Cubes of the same size of curd**

6. Cheese formation. After the curd has been poured into molds, they are left to drain for 20 minutes, followed by the return of the molds every 30 minutes. This operation is repeated three times. The molds are left for 12 hours at 20° C.

7. Prematurity. After removing the cheese from the molds, it underwent a premature operation which was performed in a brine solution of 12% concentration for 12 hours at a temperature of 15°C.

8. Maturation was carried out in brine of 7% concentration over 20 days at a temperature of 4°C.

9. After the ripening stage, after the cheese had been removed from the brine, the pieces of cheese were left to simmer for 10 hours at 10°C *(figure 5)*.

Figure 5 **Simmer of cheese**

10. The packaging was performed in a vacuum, the finished product is stored at a

temperature of 4°C.

The assessment of the quality of the finished product was made by sensory and physicochemical determinations.

The putt method was used for the sensory examination, the product being analyzed by five tasters who followed the appearance, color, appearance in section, consistency, smell, and taste.

Regarding the physicochemical analysis, the water, and dry matter content, the fat content, the protein content, and the salt concentration were analyzed.

The moisture (water) content of channa is the loss in mass, expressed as a percentage by mass when the product is heated in an air oven at 102±2°C to constant mass (IS:2785:1979; Reaffirmed 1995). Dray matter content resulted from the difference, according to the relation: Day matter (%) = 100% – watter (%).

The fat content was determinated by Acid Digestion Method (MANUAL OF METHODS OF ANALYSIS OF FOODS FOOD SAFETY –Milk and Mipk Products)

The Kjeldahl Method was used to determine the protein content in cheese. Because of its great precision and consistency, as well as its ease of use, Kjeldahl is presently the most widely used method for assessing nitrogen and protein levels in meals and feeds. The contemporary Kjeldahl process entails catalytically aided mineralization of organic matter in a boiling combination of sulfuric acid and sulfate salt at a temperature of 400°C in the digesting block. The biologically bound nitrogen is transformed to ammonium sulfate during the process. The ammonia is quantitatively steam distilled and measured by titration after alkalinizing the digested solution (IDF 20-1, ISO 8968-1 Second Edition 2014-02-01 Milk and milk products - Determination of nitrogen content; AOAC 991.20 Nitrogen (Total) in Milk).

The determination of sodium chloride was performed by the Mohr method, the principle of the method consisting of the precipitation of chlorides with silver nitrate solution in the presence of potassium chromate as an indicator (MANUAL OF METHODS OF ANALYSIS OF FOODS FOOD SAFETY –Milk and Mipk Products).

RESULTS AND DISCUSSIONS

Following the analysis performed on the raw material milk, the results obtained showed that it falls within very good processing parameters.

For density, the mean value was 1.0293± 0.0001g/cm^3, the variation limits being between 1.0290g/cm^3 and 1.0296g/cm^3. The pH average was 6.52 ± 0.005.

For the water content a value of 87.22±0.03% was obtained, the difference up to 100% being represented by the dry matter content (12.78±0.03%). An important parameter for raw milk is also the fat content in the dry matter, the average value, in this case, being 8.78±0.02% *(table 1)*.

Table 1

Physico-chemical parameters of raw milk

Specification	N	$\bar{X} \pm s_{\bar{X}}$	V%	Min.	Max.
Density (g/cm^3)	5	1.0293±0.0001	0.02	1.0290	1.0296
pH value		6.52±0.005	0.17	6.51	6.54
Water (%)		87.22±0.03	0.08	87.13	87.33
Dry matter (DM) (%)		12.78±0.03	0.56	12.67	12.87
Non fat day matter (SUN) (%)		8.78±0.02	0.61	8.71	8.86
Fat (%)		3.99±0.009	0.54	3.96	4.01
Protein (%)		3.31±0.005	0.37	3.29	3.32

Regarding the fat content, the average value of the milk processed by us was 3.99±0.009% with variation limits between 3.96% and 4.01%, values that led to a coefficient of variation of only 0.54% which impresses a very good homogeneity within the batch. In the case of fat content, the minimum fat content for milk to be processed is 3.2%.

In the case of the protein level, the variation limits were between 3.29% and 3.32% values which led to an average of 3.31±0.005%.

Regarding the part of the analyzes that were the basis for expressing the quality of the finished product (Telemea Cheese), a sensory examination was performed in the first phase.

The sensory examination is performed in order to outline the overall quality of the product. It has a very important role in the consumer's perception, being one of the characteristics that give the product continuity in being processed.

By modifying some of the technological stages of obtaining the product and very importantly by reducing the amount of salt in the stages of prematurity and maturation, we were particularly interested in the impact of this consequence on the tasters. In the first stage, the external appearance of the product was analyzed, a parameter for which the weighted average score was 1.8 points. In terms of color, a weighted

average score of 2 points was obtained.

The aspect in the section was another parameter analyzed. Unlike the classic telemeau where the curd is pressed in the case of the product obtained by us in sections, several fermentation holes are highlighted and the appearance is somewhat different compared to that of the classic product. However, the tasters gave marks of 4 and 5 points, the score being between 0 and 5 points, 5 being the maximum mark.

The consistency of another feature with a high impact in terms of sensory analysis obtained an average score of 4.66 points and the weighting obtained 3.73 points.

For the smell, all the tasters gave a maximum score (5 points), the average being 5 and following the weighting, a score of 2 points was obtained *(table 2)*.

Table 2

Results on sensory analysis of Telemea cheese

No. crt	Taster	Individual score (Pi)					
		Exterior appearance	Color	Appearance in section	Consistency	Smell	Taste
1	Taster 1	4	5	4	4	5	5
2	Taster 2	5	5	5	5	5	4
3	Taster 3	4	5	5	5	5	5
4	Taster 4	5	5	4	5	5	5
5	Taster 5	5	5	5	5	5	5
6	Taster 6	4	5	5	4	5	5
Unweighted average score (Pmnp)		*4.50*	*5*	*4.66*	*4.66*	*5*	*4.83*
Weighted average score (Pmp)		**1.8**	**2**	**3.73**	**3.73**	**2**	**5.80**
Weighted total score		**19.06**					

The last characteristic analyzed was taste, the characteristic that has the highest value of the weight factor. For the taste, out of the five tasters, four gave 5 points and one taster gave 4 points, results that led to an average score of 4.83 points and following the weighting obtaining 5.80 points.

The final score recorded by the product that was the objective of this study was 19.06 points out of a total of 20 points, which places the product in the VERY GOOD category.

For the physicochemical determinations of the Telemea cheese product, determinations were made to find out the water content, where the calculated average value was 53.54±0.10% with limits of variation between 53.21% and 53.87 % fact that led to the obtaining of a coefficient of variation of only 0.45% the studied character being a very homogeneous one.

In terms of dry matter content, the mean value was 46,45±0,10%. For the fat content, the calculated average value was 22.18 ± 0.01%, the minimum value being 22.15% and the maximum reaching a level of 22.21% *(table 3)*.

Table 3

Physico-chemical parameters of Telemea cheese

Specificare	N	Estimatori statistici			
		$\bar{X} \pm s_{\bar{X}}$	V%	Minima	Maxima
Water (%)	5	53.54±0.10	0.45	53.21	53.87
Dry matter (%)		46.45±0.10	0.52	46.13	46.79
Fat (%)		22.18±0.01	0.10	22.15	22.21
Protein (%)		17.56±0.15	1.95	17.19	18.01
Salt content (%)		1.92±0.02	2.55	1.89	2.01

Analyzes were also performed in order to establish the protein content of the product made by us; for this parameter, the average value was 17.56±0.15% the variation limits being between 17.19% and 18.01% which led to a coefficient of variation of 1.95% by printing the analyzed lot a very homogeneous character.

The salt content, the last quality index analyzed recorded a minimum value of 1.89% and the maximum was 2.01% values that led to an average of 1.92±0.02%. The studied character showed a very good homogeneity and in this case the value of the coefficient of variation was 2.55% *(table 3)*.

CONCLUSIONS

The quality of the raw material milk has a special importance on the final product, its quality having an important role, all the more important because the milk normalization operation was not performed.

The changes that were made on the technological flow of obtaining the product led to the obtaining of a product that obtained, after the sensory examination, the very good coffee, the score being 19.06 points out of 20 points.

Following the physicochemical analysis, significant changes were made on the salt content, a parameter for which the average value was only 1.92±0.02%.

As a final conclusion of the study, we can say that in the case of maturation of 20 days the brine with a concentration of 7% ensures a good shelf life of the product and a taste liked by tasters.

REFERENCES

Barbara Walther, Alexandra Schmid, Robert Sieber, Karin Wehrmuller, 2008 - *Cheese in nutrition and health,* Dairy Sci. Technol. 88:389–405.

Combs W. B., Martin W. H., Hugglar N. A. 1924 – *Clarification of milk for cheese making*. J. Dairy Sci. 7:524–529

El Soda M., Madkor S. A., Tong P. S. 2000 - *Adjunct cultures: Recent developments and potential significance to the cheese industry*. J. Dairy Sci. 83:609–619

Fox P.F., O'Connor T.P., McSweeney P.L.H., Guinee T.P., O'Brien N.M., 1995 - *Cheese:physical, biochemical, and nutritional as-pects, Adv. Food Nutr. Res. 39 163–328.*

ISO 8968-1:2014 *[IDF 20-1:2014] Milk and milk products — Determination of nitrogen content — Part 1: Kjeldahl principle and crude protein calculation.*

Ufuk K., Goknur T., 2008 - The Traditional Cheeses of Turkey:Central Anatolian Region, Food Reviews International, 24:74–94

Kourkoutas Y., Bosnea L., Taboukos S., Baras C., Lambrou D., Kanellaki M., 2006 - Probiotic cheese production using *lactobacillus casei* cells immobilized on fruit pieces. J. Dairy Sci. 89, 1439–1451.

Monti L., Negri S., Meucci A., Stroppa A., Galli A., Contarini G., 2017 - Lactose, galactose and glucose determination in naturally "lactose free" hard cheese: HPAEC-PAD method validation. Food Chem. 220, 18–24.

Mihaela IVANCIA, DOLIŞ, M.Ghe., Carmen Giorgeta NICOLAE, USTUROI, M. G., Roxana Nicoleta RAŢU, 2019 - *Study regarding the quality of milk from cows reared on the rediu farm, Scientific papers* – Series D-Animal Science, Vol. 62, pp. 225 – 230.

Roxana Nicoleta Raţu, Usturoi M.G., 2019 - *Research regarding quality of raw cow milk utilised in obtaining of medium-hard cheeses*, Lucrări Ştiinţifice - Seria Zootehnie, vol. 71(24), pg. 172 – 175.

Roxana Nicoleta RAŢU, DOBRE V., DOLIŞ M.G., Mihaela IVANCIA, USTUROI M.G., 2020 - *Research on the quality of the salty cheese obtained in the microunit production from USAMV Iasi*, Lucrări Ştiinţifice – vol. 63(1)/2020, seria Agronomie pp. 113 – 120.

SR 1981/2008 pentru „Branza telemea - tipul Telemea proaspata de vaca – calitatea II"

Vedamuthu E.R., Washam C., 1983 - *Cheese, in: Reed* G. (Ed.), Biotechnology, Verlag Chemie, Weinheim, Germany, , pp. 231–313.

FOOD SAFETY AND STANDARDS AUTHORITY OF INDIA MINISTRY OF HEALTH AND FAMILY WELFARE GOVERNMENT OF INDIA NEW DELHI, 2015 - *MANUAL OF METHODS OF ANALYSIS OF FOODS FOOD SAFETY –Milk and Mipk Products* (Lab. Manual 1)
https://old.fssai.gov.in/Portals/0/Pdf/Draft_Manuals/MILK_AND_MILK_PRODUCTS.pdf