

RESEARCH REGARDING QUALITY OF MILK AND OF SOME DAIRY PRODUCTS OBTAINED INTO A SMALL PRODUCTION UNIT

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Abstract

After establishment of milk fat content we obtain a mean value for this parameter of $3.42 \pm 0.21\%$, this one being with 0.22% higher than the one imposed by firm's standard.

Milk acidity was inside the limits imposed by the same standard, respectively 15–19°T, being with 2.5°T higher than the accepted minimum. As mean, the established value for this quality physical parameter was $17.5 \pm 1.98^{\circ}T$.

The product "Telemea cow cheese" was appreciated also through its physical-chemical characteristics, observing that these ones were into product's standard.

Regarding dry matter rate, was observed that this one was very close to the one imposed by standard (min. 43%), being of $43.37 \pm 2.44\%$.

Salt content was situated at the inferior limit for the value imposed by standard (2.5-4.0), mean determined value being $3.11 \pm 0.48\%$.

The fat rate reported to dry matter, recorded a calculated mean value of only $41.50 \pm 1.86\%$, inferior, to the demands imposed by standard (42%) with 0.50%.

The product "Fresh cow cheese" presented sensorial characteristics in conformity with product standard, having a white to a white-yellowish colour, with compact mass and a soft consistency.

Dry matter rate determined into final product overcome the minimum imposed by standard (20%), being $21.2 \pm 2.08\%$.

Content in protein substances for fresh cow cheese was, in mean, of $17.6 \pm 1.27\%$, with +0.6% higher than the minimum accepted value.

Acidity of fresh cow cheese was into the limits imposed by product standard (210–220°T), being obtained a mean value of $215.31 \pm 10.14^{\circ}T$.

Key words: raw milk, chemical composition, fresh cow cheese, Telemea cheese

INTRODUCTION

Milk is one of the basic foods for all categories of ages and also it is the raw material for a various assortments of products, both for alimentary use, as well as for industrial utilization [5].

In ancient documents which refer to life conditions of peoples who lived with thousands of years ago in Europe or in Mediterranean Sea region it is mention the fact that humans knew milk, which was

consummated per se as well as under the form of dairy products, especially cheeses.

Considered to be an "alimentary universe" milk is a complete and irreplaceable food, due to its multiple beneficial effects, such as mineralizing action at youngsters; anti-decalcified action at adults [18].

Milk have a remarkable importance because assure a very good nutritive value for foods [1, 2, 14, and 18].

The alimentary or nutritive value of a product represents its main quality and it is even greater, the better it responds to the demands of organism [1, 14].

An important role for realization of rational nourishment is allocated to milk and

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The manuscript was received: 07.10.2019

Accepted for publication: 04.11.2019

dairy products utilised per se or in combinations with other foods [2, 14].

At global level, consumption of milk/inhabitant is a very important indicator for life standard, reason for what in developed countries milk production represents 30-40% from the gross income realised by agricultural production [17, 18].

Cheese is one of the most important foods made from milk [12, 13].

So, function of taste, we could choose from various assortments, from autochthonous cheese (cow, sheep, buffalo, goat, in bellows, melted cheese) till imported speciality cheeses, with mould, garlic, vegetables or even with fruits.

No matter of the assortment, cheese is an excellent source for calcium, vitamins and fats for organism, as well as good source for the high quality proteins, which are easily to be digested [14].

Proteins provide all the essential amino acids, substances which organism couldn't produce by it.

Amino acids are very useful in production of healthy tissues [14].

Nutritionists sustain that only 70 grams of Emmental cheese contain as much proteins as 100 grams of meat or as two eggs [14].

Cheese contains essential (A, B₂, B₁₂ and D), in a rate which varies function of milk type from which cheeses are obtained, processing technology and maturation period.

Because, the highest part from milk fat remain into cheese, all the soluble vitamins in fat could be founded in it, into a higher concentration than in milk.

In cheese it is founded the highest rate of calcium from the milk utilised in processing, as well as important quantities of zinc and phosphorous.

Calcium is essential for children, as well as for pregnant women, whom, in case of lack of calcium could suffer osteoporosis.

Pressed cheese contains around 720 mg Ca/100 g product, while fresh cheese contains between 32 and 60 mg Ca/100 g product.

Fat content in cheeses varies very much function of milk type from which it is produced [3, 4, 6, 7 and 10].

Minimum percent of fat reported to dry matter and maximum percent of moisture are

controlled by firm's standards as well as by legislation.

Cheeses are an important source for linoleic and linolenic essential fatty acids.

Fatty acids are precursors of prostaglandin which have a unique physiological role in human organism.

During maturation a small amount of fat is hydrolyzed in volatile fatty acids: caproic, caprylic and capric acids which contribute to formation of cheeses' aroma [8, 10 and 11].

MATERIAL AND METHOD

Methods for appreciation of milk quality

Aspect. Normal milk obtained from healthy animals, is a homogenous liquid with a white-yellowish colour, without visible strange parts and without sediments [5, 20].

Normally, milk is opaque, feature conferred to milk by fat in suspension and protein substances which for a colloidal-opaque solution.

Milk is losing its opacity in the case of falsification, after polluting with different germs which break down casein or at an excessive feeding regime with green fodders.

Aspect is appreciated by passing of milk from a vessel to another; by pouring could be observed the homogeneity as well as the presence or the lack of strange bodies in suspension [5, 19, and 20].

Consistency. It is determined at the same time with aspect, examining the track left by milk on vessel's wall.

Normal milk has a fluid consistency, apparition of filamentous, viscous or mucilaginous consistency indicate a udder illness or disrespectful of milking hygiene.

Smell is appreciated at opening of milk vessel. Fresh milk has a pleasant and characteristic smell, due to volatile fatty acids.

Apparition of strange odours indicates that milk is stale or its obtaining was realised in non-hygienic conditions.

Taste of normal milk is sweetish, pleasant, and specific to fresh milk, due to the presence of lactose and the aroma is also pleasant due to its components.

Apparition of some taste modifications indicates an unsuitable nourishment or disrespectful of milking and storage technologies.

Freshness degree of milk: is determined through various methods: boiling test, alcohol test, titration.

Alcohol test. Into a Berzelius glass or into a well washed and dried test tube are introduced (using a metallic thimble) 1-2 ml alcohol with 61 degrees and after that, an equal volume of milk; the content of test tube is well mixed by stirring.

Apparition of some casein flakes on test tube walls show that milk acidity is high, of 18°-19°T [5, 19, and 20].

If milk is fresh the flakes don't appear.

Finesse and the type of protein precipitate from milk, for different acidities have the following interpretation:

- 21-22°T acidity, very fine flakes;
- 22-24°T acidity, fine flakes;
- 24-26°T acidity, flakes with medium size;
- 26-28°T acidity, flakes with rough size
- 28-30°T acidity, very big flakes.

Titration test (Thörner method).

The method's principle is based on acids' neutralization from a milk volume, with a NaOH solution in the presence of phenolphthalein 1% as indicator.

Acidity is expressed in °T at 100 ml milk, using for titration a solution of NaOH 0.1 n.

Working way: with a pipette are taken 10 ml of milk which are introduced into an Erlenmeyer glass of 100 ml. Next will be added 20 ml of distillate water and 2-3 drops of phenolphthalein 1%.

It will be well stirred and titrated with a solution of NaOH 0.1 n, mixing till apparition of a rose light coloration, which persists for 1 minute.

Acidity, in this case, is equal with:

$$A (^{\circ}T) = 10 \times V,$$

V = volume of NaOH 0.1 n, used for titration (ml).

Cow milk has the acidity of 18-19°T.

Determination of dry matter, fat and density.

Milk nutritive value, as well the output in different dairy products, varies function of milk content in dry matter, its rate being between 11.5% and 13%, with a mean of 12.5%.

At the processing unit, determination of those three chemical components is realized with a milk analyser fully automatic

EKOMILK type, which provides necessary information into an interval of only 180 seconds.

The main features analysed by EKOMILK are the following:

- fat: 0.5% - 9% \pm 0.1%;
- non-fat dry matter: 6% - 12% \pm 0.2%;
- density: 1.026 – 1.033 g/cm³ \pm 0.0005;
- proteins: 2% - 6% \pm 0.2;
- water added in milk: 0% - 60% \pm 5%;
- lactose: 0.5% - 7%, with a precision of \pm 0.25;
- freezing point from 0 to -1000°C;
- temperature: 0-50°C with a precision of \pm 0.1°C.

The analysis kit includes analyser, serial cable RS 232 and a CD for computer; this one made a data base with the name of the person who collected milk, as well as with milk quality and parameters.

Methods for appreciation of chesses quality

Gathering of samples is realised on lots from the same assortment and quality function of number of packs.

From a lot are checked 6% from blocks, and from each of it will be extracted a portion of around 200 g, in such way to include all the layers.

Gathering is realised with special probes or by cutting into slices.

Before analysis, samples are grinded and after that are well mixed till homogenization.

In the moment of effectuation of sensorial, physical or chemical analysis, samples must have the temperature of 20 \pm 2°C.

Sensorial examination.

Fresh cow cheese must be as a fine paste, creamy and soft, non-breakable, with a white-yellowish colour, with pleasant taste and smell, characteristic to lactic fermentation.

It is not permitted the presence of bitter, yeast or mouldy taste as well as the existence of a higher acidity caused by utilization of a big quantity of leaven.

Telemea cheese is presented as whole blocks, with a parallelepiped profile or triangular profile with the mass of around 0.5 kg.

In the same packaging unit are allowed 3-8% breakables, function of cheese age (by breakables meaning particles with mass fewer than 100 g).

The blocks' surface must be clean, without modification of colour and consistency.

In section, aspect is compact, eventually with rare pressing points, being allowed to contain black onion (*nigella sativa*) seeds distributes in the whole mass.

Colour is white, uniform (sheep milk telemea) or yellowish (cow milk telemea), and smell and taste is characteristic to the milk which was processed (sheep, cow or buffalo).

They must cover totally the blocks of cheese, to be clean, without foam, without flakes, and without smell and taste changes.

Determination of fat (acid-butyrometric method).

Fat from cheese is separated into a butyrometer by centrifugation, under the action of isoamyl alcohol and heat, after a previous dissolution of protein substances in sulphuric acid [12, 13].

Working way: Are introduced 3 ± 0.005 g from prepared cheese sample into the small glass of Van Gulik butyrometer, which after that is mounted at its inferior opening; through superior orifice is introduced by using a pipette sulphuric acid till the small glass with cheese is covered but not more than 2/3 from butyrometer body.

The cork is placed and is subjected to heating for 5 minutes at $65 \pm 2^\circ\text{C}$, into a water bath, after that is shaken intensely for 10 seconds; heating and shaking is alternatively repeated till total dissolution of protein substances (30–60 minutes).

The butyrometer is removed from water bath and is added 1 cm^3 of isoamyl alcohol, is stir for 3 seconds; sulphuric acid is added till the mark of 35% on butyrometer's scale, cork is placed and butyrometer is stirred by successive rollovers for 10 seconds.

Is once again introduced in water bath at $65 \pm 2^\circ\text{C}$, and it is stirred by successive rollovers; after that is centrifuged for 10 minutes at 1000–1200 rpm.

Butyrometer is introduced in water bath ($65 \pm 2^\circ\text{C}$) for 5 minutes and after that the

values between the upper end and lower end of butyrometer column are read.

Fat content reported to dry matter (FDM) is calculated as follows:

$$\% \text{ fat (FDM)} = [F/(100-W)] \times 100,$$

where:

F -- fat content determined with butyrometer, (%);

W - water content of product, (%).

Determination of salt content (only for Telemea assortment).

Chlorines from products directly precipitate as Ag chlorine, with a solution of silver nitrate, in the presence of potassium chromate as indicator [15, 16].

Working way: Are weighted 2 g of cheese with a precision of 0.01 g into a porcelain capsule; then is added 30 cm^3 hot distillate water till a very fine suspension is obtained.

Sample is let for 10–15 minutes to rest mixing from time to time, after that is filtered into a conic glass balloon.

It is washed till disappear of chlorine ion (checking with solution of silver nitrate), and in the obtained filtrate is added 0.5 cm^3 solution of potassium chromate and after that is titre with a solution of silver nitrate till the obtaining of a pink brick-red colour.

Calculus is realised with the formula:

$$\% \text{ NaCl} = V/m, \text{ where}$$

V = volume of silver nitrate solution 2.906% used for titration, in cm^3 ;

m = mass of the analysed product, in grams.

Salt must correspond with standards and could be founded in two forms: salt obtained by evaporation and edible salt.

Determination of acidity.

Acidity from a certain volume from the prepared sample for analysis is neutralized by titration with a solution of sodium hydroxide 0.1 n, in the presence of colour indicator, phenolphthalein [5, 19, 20].

Working way: Are weighted 10 g of sample, with a precision of 0.01 g, which are placed into a porcelain capsule; are minced with $2-5 \text{ cm}^3$ water and with 1 cm^3 solution of phenolphthalein, till we will obtain a uniform paste.

Then is titre with a NaOH solution, mixing continuously, till apparition of a pink colouration, which persists for 1 minute.

There are effectuated, in parallel, two determinations from the same prepared sample. Acidity is expressed in Thörner degrees:

$$\text{Acidity } (^{\circ}\text{T}) = (\text{V}/\text{m}) \times 100$$

V = volume of NaOH 0.1n solution used for titration ul;

m = mass of the analysed product, in grams.

RESULTS AND DISCUSSIONS

Quality of raw milk

The first effectuated operation when raw milk is received in the processing unit was its qualitative appreciation.

So, were established the eventually defects of it and the ways in which the output at processing is influenced, further being establish the sensorial and physical-chemical features of it and for the final products.

After sensorial evaluation of raw milk, we conclude that weren't any deviations from standard (tab. 1).

Table 1 Sensorial features of raw milk

Test	Standard	Obtained results
Colour	White-yellowish	White, with yellow nuances
Smell	Pleasant, characteristic to crude milk	Pleasant, characteristic
Taste	Sweetish, without strange tastes	Sweetish; weren't identified any strange taste
Test with alcohol	Stabile	Stabile
Test for antibiotics	Negative	Negative

Milk was like an opalescent liquid having a white colour, with a slightly yellow nuance. Research took place during summer season, in which animals consummated a large quantity of green fodders and from this reason was observed the existence of a lower rate for fats.

Smell was pleasant, characteristic to crude milk and the taste was sweetish.

After effectuation of alcohol test, milk was stable, without any flakes and the results of analysis for antibiotics were negative.

Further we proceed to physical-chemical appreciation of milk, the main studied parameters being represented by acidity, temperature and density, fat and dry matter content.

For fat content we obtained a mean value of $3.42 \pm 0.21\%$, this one being with 0.22% higher than the one imposed in firm's standard. Calculating the variation coefficient we obtain a value of 17.64%, fact which allow us to characterize this character as being without homogeneity (tab. 2).

Table 2 Physical-chemical characteristics of raw milk

Specification	Standard	Obtained values		Differences face to standard
		$\bar{X} \pm s_x$	V%	
Fat (%)	min. 3.2	3.42 ± 0.21	17.64	+0.22%
Acidity ($^{\circ}\text{T}$)	15+19	17.5 ± 1.98	10.29	+2.5 $^{\circ}\text{T}$
Density (g/cm^3)	1.029	1.031 ± 0.002	9.71	+0.002 g/cm^3
Non-fat dry matter (%)	min. 8.2	8.83 ± 1.35	4.20	+0.63%
Temperature ($^{\circ}\text{C}$)	max. 14 $^{\circ}$	11.2 ± 0.2	6.37	-2.8 $^{\circ}\text{C}$

Milk acidity was inside the limits imposed by standard, respectively 15–19 $^{\circ}\text{T}$, being with 2.5 $^{\circ}\text{T}$ in comparison with the accepted minimum. In mean, the established value for this physical quality parameter was $17.5 \pm 1.98^{\circ}\text{T}$. Variation coefficient was 10.29%, showing a good homogeneity for the character.

Milk density had a mean value of $1.031 \pm 0.002 \text{ g}/\text{cm}^3$, being higher with 0.002 g/cm^3 face to the one indicated into firm's standard. Character proved to be homogenous, variation coefficient being at a level of 9.71% (tab. 2).

Percent of non-fat dry matter had a mean of $8.83 \pm 1.35\%$, being higher in comparison with minimum standard of 8.2% , with a positive difference of 0.63% .

Also this character was very homogenous $V\%=4.2$ (tab. 2).

Quality of product Telemea cheese

Product presented sensorial features in according with firm standard, having a white to white-yellowish colour, with a compact mass and a uniform consistency. As aspect in section, was presented as a clean paste, uniform at transversal cutting (tab. 3).

Product Cow telemea cheese was appreciated also by its physical-chemical characteristics, observing that those ones were inside the standard.

Regarding dry matter content, was observed that this one was very close to the value imposed by standard (min. 43%), being $43.37 \pm 2.44\%$. Character was very homogenous, the value of variation coefficient being under the level 10% ($V\%=7.84$) (tab. 4).

Table 3 Sensorial characteristics for Cow telemea cheese

Tests	Final product	Standard
External aspect	Whole pieces, with clean surface.	Whole pieces, with clean surface, on which could appear black onion seeds. Aren't allowed pieces with mouldy, dipped, mucilaginous, reddened surface or with impurities.
Colour	White, till white yellowish, uniform in the whole mass	White or white with slightly yellowish nuances, uniform in the whole mass.
Aspect in section	Clean paste, uniform, are allowed pressing spaces and fermentation spaces.	Clean paste, uniform, are allowed rare pressing spaces. Are not allowed non-homogenous paste, with impurities, reddish, yellow or with mould and neither a spongy appearance.
Consistency	Compact mass, with uniform consistency; are allowed a slightly breakable consistency.	Compact mass, uniform, which can be easily broken without being breakable. Are not admitted a chalky or rubbery consistency.
Smell	Pleasant, sour, slightly salted.	Pleasant, characteristic to assortment, sour and slightly salted.
Form and dimensions	Parallelepiped pieces, with a square base of 11×11 cm.	Parallelepiped pieces, with a square base of $9-13$ cm and h of 9 cm.

Table 4 Physical-chemical characteristics of Cow telemea cheese

Specification	Standard	Obtained values		Differences face to standard
		$X \pm s_x$	V%	
D.M. (%)	min. 43	43.37 ± 2.44	7.84	+ 0.37%
Salt (%)	2.5-4.0	3.11 ± 0.48	9.86	+ 0.61%
Fat/DM (%)	42	41.50 ± 1.86	6.07	- 0.50%
Protein substances (%)	min. 16	16.18 ± 1.02	5.91	+ 0.18%

Salt content was situated at the inferior limit from standard (2.5-4.0), determined mean value being $3.11 \pm 0.48\%$, and character was very homogenous ($V\%=9.86$) (tab. 4).

Percent in fats related to dry matter, recorded a mean value of only $41.50 \pm 1.86\%$, inferior, to standard requirements (42%) with 0.50% . Variability of character was low, being calculated a value of 6.07% (tab. 4).

After analysing the character represented by protein substances from cow telemea

cheese, we observed that this one was homogenous ($V\%=5.91$), with a mean value of $16.18 \pm 1.02\%$, very close to the minimum imposed by standard (16%) (tab. 4).

Quality of product cow fresh cheese

This product presented sensorial features in according with product standard, having a white colour to a white-yellowish one, with compact mass and soft consistency. As aspect in section it was presented as a clean paste (tab. 5).

Table 5 Sensorial characteristics of Fresh cow cheese

Tests	Final product	Standard
External aspect	Paste aspect, with clean surface, without spots.	Paste with clean surface, on which could appear black onion seeds. Aren't allowed pieces with mouldy, dipped, mucilaginous, reddened surface or with impurities.
Colour	White, till white yellowish, uniform in the whole mass.	White or white with slightly yellowish nuances, uniform in the whole mass.
Aspect in section	Clean paste, uniform, is allowed pressing spaces.	Clean paste, uniform, are allowed rare pressing spaces. Are not allowed paste with impurities, reddish, yellow or with mould and neither a spongy appearance.
Consistency	Mass is like a paste, with soft consistency.	Mass is like a paste, which can be easily broken without being breakable. Are not admitted whey separation.
Smell	Pleasant, sour.	Pleasant, characteristic to assortment, sour.

Percent of fats determined in the case of fresh cow cheese, was situated at a level of $0.1 \pm 0.002\%$, equal with product standard. Character was very homogenous, variation coefficient having a calculated value of 3.21% (tab. 6).

Table 6 Physical-chemical characteristics of fresh cow cheese

Specification	Standard	Obtained values		Differences face to standard
		$\bar{X} \pm s_x$	V%	
Fat (%)	0.1	0.1 ± 0.002	3.21	-
Dry matter (%)	min.20	21.2 ± 2.08	14.38	+1.2%
Protein substances (%)	min. 17	17.6 ± 1.27	8.65	+0.6%
Acidity ($^{\circ}\text{T}$)	210-220	215.31 ± 10.14	11.92	$\pm 5.31^{\circ}\text{T}$

Percent of dry matter overcame the minimum imposed by standard (20%), being de $21.2 \pm 2.08\%$.

Character was less homogenous, calculated value for variation coefficient being de 14.38% (tab. 6).

Content in protein substances for fresh cow cheese was, in mean, of $17.6 \pm 1.27\%$, with $+0.6\%$ higher than the minimum accepted value.

Studied character was homogenous, variation coefficient recording a value of 8.65% (tab. 6).

Acidity of cow cheese was inside the limits imposed by product standard (210-220 $^{\circ}\text{T}$), being obtained a mean value of $215.31 \pm 10.14^{\circ}\text{T}$.

In this case character presented a medium variability, the obtained value being 11.92% (tab. 6).

CONCLUSIONS

After results' analysing we notice the fact that unit produce cheeses of superior quality and 1st quality, fact due to remarkable quality of raw milk as well as respectful of processing technologies.

Even if were observed slightly deviations of sensorial and physical-chemical features or raw milk and implicitly of final products, those ones were inside or very close to standards requirements which govern into processing unit.

So, raw milk presented a white-yellowish colour, smell was pleasant and characteristic to crude milk, taste was sweetish, without being noticed strange tastes and smells; at alcohol test, milk was.

From the point of view of physical-chemical features, studied milk presented higher levels than in standard for fat ($+0.22\%$), density ($+0.002$) and non-fat dry

matter (+0.63%); milk acidity was lower with 1.5°T, and temperature with 2.8°C than the accepted maximums for those two quality parameters.

Cow telemea cheese presented very good sensorial and physical-chemical properties.

So, at sensorial examination was noticed that cheese pieces were entire, with a clean surface, having a white colour till a yellowish one and being uniform in the whole mass.

It had a clean paste, compact mass, uniform consistency and taste was pleasant and slightly salty, specific to assortment.

Referring at physical-chemical characteristics, the studied telemea cheese presented higher mean levels than the ones in standards for dry matter content (+0.37%), salt (+0.61%) and protein substances (0.18%) and a little bit lower (-0.5%) for fat content.

Fresh cow cheese also presented very good sensorial properties (white colour, soft consistency, specific taste, slightly sour).

Higher values than the accepted minimum level were recorded for product dry matter (+1.2%) and for protein substances content (+0.6%); acidity and fat content being into the limits imposed by standard.

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