The sheep milk quality as a raw material for the telemea cheese assortment from Vinţe Farm

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Abstract. Sheep milk has a high nutritional value and is an important source of fatty acids, calcium, magnesium, phosphorus, iron, etc., which contribute to the body's health. In addition to the use of raw milk, the main use of sheep's milk is the production of traditional cheeses obtained by small farmers or regional cheese producers. However, the quality of the obtained cheeses depends on the raw material, namely milk, which has to be free of pathogenic microorganisms. This study aims to highlight the importance of the quality of raw milk to obtain high-quality cheeses. Milk and telemea cheese samples were collected from Țurcană sheep breed farmed in Vințe farm, Cluj county, Romania. The physicochemical analyses were performed for both milk and cheese. The physicochemical analysis results for milk were: crude fat 8.98±0.18%, crude protein 5.08±0.16%, density 1.0345±0.01 g cm^{-3}, acidity 17.2±0.97%. For the cheese, the results were: water 45.2±0.74%, dry matter (DM) 54.8±0.74%, crude fat 51.93±2.05% reported to DM, salt 5.63±0.31% and acidity 272.6±11.82%. The pleasant taste of cheese is due to the quality of the raw milk and the brine used.
Key Words: density, fat, milk preparations, proteins, telemea cheese.

Introduction. Nutrition is the most important factor in maintaining health. Choosing safe and high quality products helps the body to strengthen its immune system. One such food product is sheep milk, as well as the assortments of cheese from this milk. Sheep milk has a high nutritional value, being an important source of bioactive substances, fatty acids, calcium, phosphorus, iron, magnesium, etc. (Mohapatra et al 2019; Flis & Molik 2021). Due to these properties, it is also called "white blood" (Iurcă 1998). In addition to the use of raw milk, the main use of sheep's milk is the production of traditional cheeses obtained by small farmers or by regional cheese producers (Gonzales-Barron et al 2017). In Romania, sheep breeding is a traditional activity. This is reflected by the increase of herds by 23.07% from 2010 to 2019 (Popescu 2021). Telemea cheese is one of the main varieties produced from sheep milk. However, the quality of the cheeses obtained depends on the raw material, which must be free of pathogenic microorganisms, through proper management (Van den Brom et al 2020).

The sensorial and physicochemical characteristics of telemea cheese can be influenced by several factors such as the salting method (sodium or potassium chloride or by natural brine) (Mocanu et al 2018), the maturation and marinating time, the milk content of fat, protein, minerals, etc., pasteurization or not of the raw milk, and others (Roibu et al 2007). Information regarding the physicochemical analysis as well as the obtaining process of telemea cheese is essential for the development of the sheep milk processing industry to obtain high quality products. Therefore, this study aims to highlight the quality of raw sheep milk to obtain the assortment of telemea cheese in a Romanian farm.

Material and Method. The biological material comes from the family sheep farm "Vințe", located in Sic, Cluj County, Romania. The research was carried out from April to

June 2021. The sheep belong to the Țurcană breed. The farm consists of 2760 sheep. Milking on the farm is done manually, by inserting the sheep into the lathe. Every day, milk is obtained 2 times, at an interval of 11 hours, in the morning and evening. Within "Vințe" farm, various assortments of products are exclusively made from sheep's milk, such as: fresh curd, "urdă", "jintuială", kneaded cheese, and the famous telemea cheese matured and salted in natural brine.

Methods to determine the quality of the sheep milk. The analyses were performed in the Laboratory of the Technology of Industrialization of Animal Products, from the Faculty of Animal Science and Biotechnology, UASVM Cluj-Napoca, Romania, in 5 samples for both milk and cheese. The samples were collected in sterile plastic containers of 500 mL for milk and plastic bags of 250 g for Telemea cheese. The samples were transported under refrigerated conditions (4–8°C) in an icebox to the laboratory at UASVM Cluj-Napoca. The organoleptic properties of milk were determined by assessing color, opacity, smell, and taste. The physicochemical analysis of sheep's milk involved the determination of fat, protein, density, and acidity. The fat content (F%) of milk was determined by the Gerber acid-butyrometer method, the density (D) of the milk by the aerometric method using the thermolactodensimeter, the protein content (P%) by the Schultz method. The milk acidity represents the degree of the acidic solution concentration in milk and is expressed by pH or titratable acidity. In our research, titratable acidity was determined by the Thörner method by titration with a NaOH solution n/10, in the presence of phenolphthalein as an indicator. Titratable acidity is given by all hydroxyl ions (OH) from the solution (Iurcă & Răducu 2005; Usturoi et al 2019).

Determining the quality of telemea sheep cheese. To determine the quality of the telemea sheep cheese, the water content, dry matter (DM%), fat reported to dry matter (F/DM%), acidity, and salt content were analyzed. The salt content was determined through the Mohr method. The obtained data in the laboratory were analyzed and interpreted descriptively using Microsoft Excel (Chighi 2008).

Results and Discussion. The quality of the Telemea cheese is mainly given by the used raw material, namely by the milk from which it is produced. It must fulfill the specific standard conditions of the species and has to be free of microorganisms.

Physico-chemical analysis of raw sheep milk used as raw material. In Table 1, the results of the physicochemical analysis of raw sheep milk used to obtain Telemea cheese are presented. The sensory and physicochemical results of the milk produced in Vințe farm show that the milk has a high content of nutrients and falls under STAS 6343-81 from 2000.

Table 1

Results of physicochemical analyses of sheep's milk

	Specification			
Sample	*Fat (%)*	*Protein (%)*	*Density g cm^3*	*Acidity ºT*
1	8.5	4.6	1.0334	15
2	9	5.4	1.0345	19
3	9.2	4.8	1.0328	16
4	8.7	5.2	1.0349	20
5	9.5	5.4	1.0345	16
x±sx	8.98±0,18	5.08±0.16	1.0345±0.01	17.20±0.97
V%	4.41	7.15	0.09	12.60
STAS	min. 6.51	5	1.033-1.035	max. 24

Note: ºT - degrees Thörner; x – mean; sx – standard error of mean; V% - variability.

The milk has a white and matte color, homogeneous, with normal consistency, an average density of 1.0345±0.01 g cm^{-3}, and a characteristic odor. The taste is a pleasant

characteristic of raw sheep's milk and it has the specific texture of the milk of this species. The mean acidity was 17.20±0.97ºT, which indicates that the milk is fresh.

Regarding the fat content, the values obtained in our study are higher compared to those of other studies (Lujerdean et al 2008; Dărăban et al 2012) for the same breed. The milk protein content can be influenced by many factors such as species, breed, feed, season, stage of lactation, etc. (Park et al 2007; Park et al 2017). Table 2 presents the ranges of sheep milk composition values at different sheep breeds and in different seasons. The average value of milk protein was 5.08±0.16%, similar to the data presented by Lujerdean et al (2008).

Table 2

Sheep milk composition (processed data)

Specification				
Fat (%)	*Protein (%)*	*Density g cm^{-3}*	*Acidity ºT*	*Reference*
6.9-10.7	4.18-7.04	1.031- 1.034	17.5-25	Evtodienco et al (2015)
5.30–9.30	4.50–6.60	1.0347–1.0384	-	Kanwal et al (2004); Haenlein et al (2006)
8.9-10.1	-	1.0340-1.0396	21.5-23	Muntean (2011)
5.31-9.27	4.53-6.60	-	-	Wendorf & Haenlein (2017)
6.09	4.56	1.032	-	Mahmood & Usman (2010)
7.28±1.10	5.83±0.79	1.034±0.004	-	Merlin Junior et al (2015)
7.26±0.13	4±0.22	1.0365±0.0009	-	Hamad & Baiomy (2010)
4.41-7.78	4.85-5.82	-	-	Jitariu & Răducu (2012)

The technological process for obtaining the telemea sheep cheese. On the farm, immediately after milking, milk is filtered through a gauze. Then the curd is introduced into the milk after it is heated at a temperature of 28-30ºC. The curdling of the milk is done with industrial curd. To determine the end of the rennet coagulation process, the coagulum is pressed with the palm facing near the walls of the container. When it is easily detachable from the pot wall and the whey is clear, the process is considered complete.

The curd is placed on a "crintă" (steel bowl, in the shape of a riverbed, which local shepherds use when squeezing whey from curd), on which the gauze is placed. After the steel bowl is filled, the coagulum is cut into slices to remove the whey, so that the maturation process is carried out properly. The gauze in which the curd is pressed is initially soaked in water, to favor whey draining, and, after it is crushed, the coagulum is tightened well with the help of the gauze. The whey is left to drain for 10 minutes and then is unwrapped to make the second cut of the coagulum. At this point, a quantity of about 200 g of coarse salt is introduced inside the chopped curd, which is then tied back.

After the gauze has been tightened again, the coagulum is pressed with a lid or weights so that the whey is removed as well as possible. It is considered that the whey has drained sufficiently when the draining is rare, in clear drops. After this process, the gauze is opened and the curd is cut into 1-1.5 kg square pieces, which are placed on the steel bowl and left for a few minutes, turning from side to side several times to define the whey leak and for hardening the cheese. The coagulum pieces are then introduced into natural brine, taken from natural salt springs, and left to mature in wooden containers, locally called „putină" (Figure 1).

The brine penetrates the mass of the telemea cheese from the exterior towards the center. The brine preserves this assortment longer, due to slowing down of the microbiological processes. Once the telemea pieces are in brine, the salt content becomes homogenous throughout its volume. To obtain a good brining process, the telemea cheese is maintained at a temperature of 17ºC, far away from heat and direct action of solar radiation or other factors that can negatively influence the process itself. The ripening of the telemea cheese needs a longer time, at least 30 days, because the longer it stays, the more aromatic and slightly "spicy" the taste becomes.

Figure 1. The wooden container called "putină".

Physico-chemical analysis of the Telemea sheep cheese. Table 3 shows the values obtained from the physicochemical analysis of the telemea cheese. Regarding the average value of the water content of telemea cheese, it is lower than the value of STAS 6343-81 from 2000, which indicates that the product obtained by us is of superior quality. The acidity of telemea cheese is influenced by several factors such as pasteurization of raw milk, but this destroys some of the native microorganisms needed in the maturation process of the cheese (Roibu et al 2007).

Table 3

The results of the physicochemical analysis of the telemea sheep cheese

	Specification				
Sample	*Water (%)*	*DM (%)*	*Fat (% S.U.)*	*Salt (%)*	*Acidity ºT*
1	42.70	57.30	45.63	6.37	290
2	45.30	54.70	58.50	4.97	258
3	46.41	53.59	52.24	4.79	233
4	44.70	55.50	52.44	6.05	295
5	46.91	53.09	50.84	5.95	287
x±sx	45.20±0.74	54.80±0.74	51.93±2.05	5.63±0.31	272.60±11.82
V%	3.65	3.01	8.85	12.43	9.69

Note: ºT - degrees Thörner; x – mean; sx – standard error of mean; V% - variability; DM – dry matter.

Conclusions. Due to the applied hygiene measures and the provided welfare conditions to animals, high quality products can be obtained. The sheep milk in this study has a higher content in fat, which reflects in the telemea cheese and complies with the normatives of STAS 6343-81 from 2000. Natural brine brings an extra flavor to the telemea cheese.

Conflict of Interest. The authors declare that there is no conflict of interest.

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