THE STUDY ON THE MANUFACTURE OF GOAT CHEESE IN THE SOUTH OF OLTENIA

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Abstract

The acidity of milk in batch I was the best of 18.66°T, in batches II and III the acidity had higher values compared to the first batch and with the maximum requirements in force. The fat content in all the lots examined was satisfactory, having values higher by 1.23 - 1.33% compared to the minimum requirements in force. In the examined batches, the protein content was in batch II of 3.5% or the minimum level according to the requirements in force and slightly higher in batch I - 3.66% and batch III - 3.67%. Among the components of milk, casein it is the component that ensures its coagulation under the action of enzymes. The casein content was the highest in batch III of 3.23%, followed by batch I - 2.97% and batch II - 2.73%. According to the requirements in force, the acidity of fresh goat cheese must not be higher than 40°T. The goat cheese from batch I falls within the requirements in force, while the goat cheese from batches II and III was obtained with a higher acidity than the requirements in force by 2.3°T, therefore it is more acidic. Comparing the data obtained with the requirements in force for goat cheese, we can mention that the water content of the cheese obtained by us was higher in all batches compared to the requirements in force (50%)

Key words*:* goat's milk,goat cheese, organoleptic indices of goat cheese, chemical composition of goat cheese.

INTRODUCTION

The present study is of scientific interest for the reasons that the manufactured product itself is a product demanded by consumers of all ages and, knowing the peculiarities of manufacturing, we will be able to prove the quality of the finished product obtained - goat cheese. Goat cheese is a cheese distinguished by its strength of taste and nutritional properties superior to other cheeses In the current global context, the new genomic technologies can represent the solution to the multiple challenges encountered by farmers in vegetable farms but also in livestock farms (Bonciu, 2023). On the other hand, there is a necessity to having alternative methods that can functioned in a friendly ecosystem such as organic farming (Bonciu, 2022 a, b).

Goat cheese is digested much easier than other cheeses because it has a low fat and milk protein content. While 100 g of goat cheese contains 3 g of protein and 4 g of fat, 100 g of cow cheese contains 15 g of protein and 20 g of fat (Matsou,G.,2008).

From an energy point of view, 100 g of goat cheese contains 60 calories, with the same amount of cow cheese reaching up to 250 calories (Banu,2007). According to specialists, a piece of cheese eaten after a meal stimulates the secretion of saliva, protects tooth enamel and restores the normal acidity of the environment in the oral cavity. 100 g of goat cheese contains 100 mg of calcium and 90 mg of phosphorus, minerals necessary for the bone system.

Calcium and phosphorus assimilate better from cheese, than from milk. Also, goat cheese is among the few natural sources of vitamin B12 (2 micrograms/100 g).The content in vitamin B12 makes cheese reduce stress, anxiety and increases the ability to concentrate. Due to its low fat content, goat cheese can also be

consumed by people suffering from atherosclerosis, kidney disease, cholecystitis, obesity (Emmons,2010).
At the same time, people with lactose intolerance can consume goat cheese, since, being fermented, it no longer contains lactose (Bogdan,N. 2017)
As such, the main purpose of the research was the quality of goat cheese made from goat milk-raw material, produced by goats of local population from the centre -southern area of Oltenia.

MATERIALS AND METHODS

In recent times, goat farming has become a cost-effective productive activity, with the production of milk and goat cheese becoming specialties appreciated by consumers. In our country, goat farming has been known since ancient times, being practiced more by breeders from the southern and central areas of the country.
As research material was chosen the goat cheese obtained from the southern area of Oltenia, from local goat population, bred in the private sector:
- batch I - Dolj County; – batch II - Olt County; - batch III - Mehedinti County.
All investigations regarding the assessment of the quality of goat milk-raw material, its processing, as well as the obtaining of goat cheese and the assessment of the quality of cheese, were carried out in the laboratory for the assessment of the quality of milk and dairy products, within the County D.S.V.S.A. (*Sanitary Veterinary and Food Safety Department*) and the Faculty of Agronomy in Craiova. A total of 9 batches of cheese out of 9 batches of milk were examined.
The average milk samples were made up of mixed milk, which after milking the goats was stored in a vessel, then it was well homogenized and after homogenization the required volume was collected - 1.5 liters. This procedure was observed for each batch of collected goat milk.
The collected goat milk was transported to the laboratory. In the batch of goat milk transported to the laboratory, the first thing that was done was heated to a temperature of 20 ± 2°C, then it was subjected to analyses(Damian,J.P.,2009). Organoleptic, physico-chemical and technological indices were determined in goat milk raw material. The quality of goat cheese obtained was appreciated by standard methods taking into account organoleptic and physico-chemical indices. All examined indices were determined using standard laboratory methods. The data obtained was statistically processed and compared with the requirements in force (Cola,M.2018)

RESULTS AND DISCUSSIONS

Cheese plays an important role in our diet, representing a rich source of nutritional factors. It has a high content of protein substances, easily assimilated vitamins and fats, mineral salts of calcium, phosphorus, magnesium, sodium. When talking about the manufacturing process of cheeses, including goat cheese, one must be very careful about the quality of milk raw material. Goat milk is a favorable environment for the development of microorganisms, their multiplication being favored by the harvesting temperature which is very close to the temperature of the development of pathogenic germs. Therefore, the collection, cooling and analysis operations of goat milk are very important.
From the literature data it follows that from the nutritional and dietary point of view the quality of goat milk is higher than the quality of cow milk.
From the organoleptic point of view, the batches of goat milk (Table 1) examined had the milk with white colour with a yellowish tinge, the specific smell of goat milk, the sweet taste and the homogeneous consistency. These indicators corresponded to the requirements in force, deviations and defects in the examined batches were not detected. Organoleptically, the milk was qualified as good goat milk-raw material for making goat cheese.
In the goat milk batches, physicochemical indices were also determined. From the data of Table 2 we note that in the milk

samples from batch II the density was lower compared to batches I and III, but also lower compared to the minimum requirements in force. The density of milk in batches I and III had satisfactory values.

Table 1 Organoleptic indices of goat millk

Indices organoleptics	Batch			Requirements in force
	I	II	III	
Colour	white with yellowish tinge	white with yellowish tinge	white with yellowish tinge	white with yellowish tinge
Smell	specific to goat milk	specific to goat milk	specific to goat milk	specific to goat milk
Taste	pleasant, sweet	pleasant, sweet	pleasant,	pleasant, sweet
Consistency	homogeneous	homogeneous	homogeneous	homogeneous

Another indicator examined was acidity, the value of which shows the freshness of milk. This indicator at batch I was the best of 18.66 m, at batches II and III the acidity had higher values compared to the first batch and with the maximum requirements in force. The fat content in all examined batches was satisfactory with values higher by 1.23 - 1.33% compared to the minimum requirements in force. The protein content is a very appreciable indicator in cheese technology, therefore the value of protein is very welcome in the raw material. In the examined groups the protein content was at batch II of 3.5% or at the minimum level according to the requirements in force and slightly higher at batch I - 3.66% and batch III - 3.67%.

Table 2. Physicochemical indices of goat milk

Specification	Batch			Requirements in force
	I	II	III	
Density, °A	30.60 ±0.11	29.46 ±0.07	31.80 ±0.35	minimum 30
Acidity, °T	18.66 ± 0.33	19.67 ±0.33	19.67 ±0.33	15-19
Fat content, %	5.33 ± 0.03	5.23 ± 0.03	5.23 ± 0.03	minimum 4. 0
Protein content, %	3.66 ± 0.14	3.50 ± 0,06	3.67 ± 0,03	minimum 3. 5
Casein content, %	2.97 ± 0.03	2.73 ± 0,03	3.23 ± 0.03	minimum 2. 7
Total dry matter content, %	14.68 ± 0.02	14.28 ±0.03	14.86 ±0.09	minimum 13
Skimmed dry matter content,%	9.35 ± 0.02	9.04 ± 0.02	9.63 ± 0.09	minimum 9. 0

Among the components of milk, casein is the component that ensures its coagulation under the action of enzymes. The casein content was highest in batch III of 3.23%, followed by batch I – 2.97% and batch II - 2.73%. The next chemical indicator, the total dry matter content, is the indicator that determines the nutritional value of goat milk and the specific consumption of milk – raw material per unit of production (in our case per kg of goat cheese). The total dry matter values were satisfactory, higher than the minimum requirements in force, for all experimental groups. The same trends were observed in the values of the skimmed dry matter.

In order for goat milk to be used in the manufacture of cheese it must be subjected to

specific analyses that will demonstrate that the raw material is suitable for cheese making.

As is known from the data of specialized literature, the technological properties of milk are influenced not so much by the chemical composition of milk, or rather by the content of separate components of milk, as by the ratio between them. According to the requirements in force for

the cheese yield to be an optimal one, the ratio between fat and protein content must have minimum values of 1.14, in our study this ratio in all batches was higher by 0.3 than the minimum values. The ratio between fat and total dry matter also tended to be higher compared to the minimum allowable (0.44) for all experimental groups. Coagulation of milk under the action of coagulation enzymes is one of the most important technological indices that determine the technological properties of milk and largely condition the profitability of the technological process. The coagulation of milk is conditioned by the content of casein which in goat milk should be not less than 75% of the total protein. In the experimental groups the casein content of the total protein was in batch II -78%, batch I – 81%, batch II - 88%. This indicator demonstrates that milk from all experimental batches is a milk containing casein and can serve as a raw material for cheese making.

Table 3. Suitability of goat milk for cheese making

Specification	Batch			Requirements in force
	I	II	III	
Fat : protein ratio	1.46	1.49	1.43	minimum 1.14
Fat : total dry matter ratio	0.57	0.58	0.54	minimum 0.44
Casein content in total protein, %	81	78	88	minimum 75
Milk yeast temperature, °C	38.33±0.33	37.67±0.33	37.67±0.33	35-40
Coagulation time, min.	15.33±0.33	17.67±0.88	18.67±0.33	up to 40
Coagulation sample, group	I	I	I	I-II
Milk expenditure / kg of cheese	4.47±0.08	5.03±0.02	4.77±0.02	average 5

The ability to coagulate milk is determined by means of the coagulation sample.

According to this sample, the milk is classified into 3 groups: Group I - milk that coagulates for 15 min. Group II – for 16-40 min, Group III - more than 40 min. It is good for cheese milk that coagulates for a maximum of 40 minutes. In our case, the milk samples from the experimental groups coagulated in: - batch I - 15.33 min., - batch II - 17.67 min., - batch III - 18.67 min.

According to the results obtained, all batches of goat milk, after the coagulation test, are classified in Group I – milk good for cheeses.

At the end of the manufacturing process, after straining and self-pressing, the cheese was obtained, it was weighed, and then determined the specific consumption of milk per kilogram of cheese. As a result, we obtained at Batches I and III milk consumption/kg of cheese respectively of 4.47 - 4.77 kg, at Batch II - of 5.03 kg.

Goat cheese from the three batches examined showed an external appearance with clean surfaces without traces of cloth, the exterior was smooth without ruptures. Uniform white color throughout the mass. Sectional appearance - small fermentation meshes, spread over the entire cheese mass that prove that fermentation was present and the rennet has taken its effect. Hard consistency presents itself as a homogeneous mass. Specific pleasant smell, a little sour for the cheese of Batches II and III. Sweet, specific taste of fresh cheese (Table 4).

Table 4. Organoleptic indices of goat cheese

Indices organoleptics	Batch			Requirements in force
	I	II	III	
External appearance	whole pieces with clean surface	whole pieces with clean surface	whole pieces with clean surface	whole pieces with clean surface
Colour	white, uniform in the whole mass	white, uniform in the whole mass	white, uniform in the whole mass	white, uniform in the whole mass
Sectional appearance	small fermentation meshes	small fermentation meshes	small fermentation meshes	small fermentation meshes
Consistency	hard	hard	hard	hard
Smell	pleasant, specific	pleasant, specific to fermentation	pleasant, specific to fermentation	pleasant, specific
Taste	sweet, specific	sweet, specific	sweet, specific	sweet, specific

From the physicochemical indices we took into account the acidity of goat cheese, water content, dry matter content and fat content (Table 5). Acidity is an indicator of the freshness of the product. High acidity is caused by: using too much milk; delayed cutting of the curd; long duration of whey drainage and its insufficient elimination; non-cooling of the cheese immediately after draining the whey; storage of cheese at temperatures > 10°C. In our case, the increased acidity of goat cheese from batches II and III is the cause of increased acidity in goat milk raw material used and as it was assumed from the beginning of cheese preparation that the product obtained will be with increased acidity .

According to the requirements in force, the acidity of fresh goat cheese must be no higher than 40°T. The goat cheese from batch I is within the requirements in force, while the goat cheese from batches II and III was obtained with an acidity higher than the requirements in force by 2.3°T, therefore it is more acidic.

Table 5. Physicochemical indices of goat cheese

Specification	Batch			Requirements in force
	I	II	III	
Acidity, °T	39.67 ± 0.33	42.37 ± 0.07	42.33 ± 0.07	40
Water content, %	52.47 ± 0.07	53.20 ± 0.11	53.27 ± 0.03	50
Fat content, %	20.63 ± 0.14	20.10 ± 0.06	20.30 ± 0.06	20 - 25

The nutritional value of a product, including goat cheese, is judged by the chemical composition of cheese.

Goat cheese in batch I is characterized by the following chemical composition: the water content is 52.47 %, the dry matter content is 47.53 %, including 20.63% of fat.

In goat cheese from batch II the water content is 53.20 %, the dry matter content is 46.80%, including 20.10% of fat.

In goat cheese from batch III the water content was 53.27%, the dry matter content 46.73% and the fat content of 20.30%.

Although the raw material was obtained from different households, goat cheese manufactured under the same laboratory conditions had approximately the same nutritional parameters.

Comparing the data obtained with the requirements in force for goat cheese, we can mention that in the cheese obtained by us the water content was higher in all batches compared to the requirements in force (50 %):

Batch I - 52.47 %; batch II - 53.20%; batch III - 53.27%. The fat content in all experimental groups was within the admissible requirements - 20-25%.

CONCLUSIONS

As a result of the research, we can submit the following conclusions:

Organoleptic indices of goat milk examined from the 3 experimental batches corresponded to the requirements in force. Milk had a yellowish-white colour, homogeneous consistency, sweetish taste, pronounced specific odor. Organoleptic defects were not detected;

- from the physicochemical indices of goat milk, we obtained higher values at the acidity indicator at batches II and III, compared to the requirements in force, the other indices were within the admissible requirements;

-the goat cheese obtained had organoleptic indices without defects. External appearance of whole pieces with clean surface. Uniform white colour throughout the mass. In the sectional appearance, small fermentation meshes, hard consistency, specific smell, pleasant sweet taste of fresh cheese were observed;

-the acidity of the cheese from batches II and III was higher, which was assumed from the beginning of the manufacturing process. In goat milk from batches II and III this indicator was higher and this regularity was maintained during the manufacture;

-the goat cheese obtained had a fat content corresponding to the requirements in force 20-25 %. The water content in the goat cheese obtained was higher by 2.47-3.27% compared to the requirements in force.

Therefore, goat milk obtained from goats of local population in the southern area of Oltenia can serve as raw material for the production of goat cheese, respecting all the peculiarities of manufacture.

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