

QUALITY CONDITIONS OF AN ASSORTMENT OF SEMI-HARD CHEESE – CACIOTTA

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Abstract

In our country, there is no tradition of processing semi-hard products, but the cheese assortments included in this category are quite appreciated by consumers. From this category, the most common on store shelves are Tilsit Cheese, Edam Cheese, Gouda Cheese, and Trappist Cheese. This paper presents the technological stages and the quality of Caciotta cheese, an assortment of semi-hard cheese produced in the mountainous areas of Italy. The cheese was obtained at the USV Milk Processing Workshop. To analyze the product from a qualitative point of view, sensory and physicochemical determinations were performed, namely the determination of water content%, S.U. %, fat content%, protein level, and pH value. The determinations were performed after the cheese matured for 30 days. Regarding the dry matter content, the average value was $54.01 \pm 0.12\%$, the protein level was $18.11 \pm 0.09\%$ and the pH value was $5.28 \pm 0.09\%$. The sensory characteristics totaled a weighted average score of 20 points, which places the assortment in the very good quality category. Given the results obtained and the positive impact on the tasters, we can say that this assortment can be successful on the market in our country.

Key words: cheese, quality, matured

INTRODUCTION

Caciotta is a cylinder-shaped, aged or semi-aged soft cheese with a particular flavor manufactured from any sort of milk. This cheese has just been around for a few years. Initially, it was largely made with sheep's milk during the winter months, and then, depending on the region, it was also made with other types of milk. This cheese was created primarily as a substitute for pecorino, with the goal of creating a sweeter, more delicate product that was also quicker and easier to prepare [4].

Caciotta is a broad name that refers to a range of soft cheeses made in various Italian areas, particularly in central Italy. Small/medium-sized cheeses (0.8-2 kg) with a low height (4-8 cm) and diameter of 8-10 cm up to 16 cm, manufactured with cow's milk (tipo dolce), ewe's milk (tipo saporito o laziale), or both, aged for one to several weeks [16, 18].

Caciotta della Garfagnana is historically made in the Serchio river's upper valley, known as Garfagnana. The Lucca province is located in the northwestern part of Tuscany, one of the central Italian regions. Garfagnana's cattle husbandry is characterized by the physical morphology of the area and the tiny size of the farms [4, 18].

Caciotta della Garfagnana is made in small dairies and family plants using raw or low pasteurization cow's milk from small-scale farms in the area. It's a cylindrical cheese with flat faces (8–10 cm in diameter) and a straight or slightly convex rim (4 cm) that weighs between 800 g and 1 kg. The rind is thin, uneven, and yellowish-white, with little eye-like dots and a semi-soft feel. The inner part is whitish and has a semi-soft texture. A broad variety of cheeses can be obtained because not all dairies use the same manufacturing technique. Furthermore, the sanitary quality of raw milk utilized in the making of cheese is frequently unpredictable. This is mainly due to poor milking management, which results in microbiological flaws due to the expansion of

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spoilage microorganisms during ripening (early gas-blowing) [14, 18].

The quality of raw milk plays a very important role in terms of the quality value of the finished product. When we talk about the quality of the raw material, we refer to both the physicochemical and the microbiological characteristics [5, 7].

The purpose of this work was to obtain a Caciotta cheese from pasteurized milk and seeded with lactic cultures (mesophilic cultures were used). Flora Danica is a mesophilic culture that gives soft cheeses like Havarti, Gouda, Edam, Camembert, Brie, Feta, Blue, Buttermilk, Sour Cream, Cream cheese, Creme Fraiche, and Cultured Butter a buttery flavor. This culture produces a little amount of carbon dioxide gas, making it an excellent choice for cheeses with a lighter texture.

Determinations were also made in order to establish the quality of the raw material milk (by establishing the main physicochemical indices) but also determinations on the finished product.

MATERIAL AND METHOD

A quantity of 200 L of milk was processed for the proposed purpose. Determinations were made for the raw material milk to determine the density (g/cm^3) value, and the pH value; to identify the water content (%), dry matter (%), non-fat dry matter content (%), fat content (%) and protein level (%).

Milk density was measured using a thermolactodensitometer. This physical trait represents the ratio between the milk mass at $+20^\circ\text{C}$ and the mass of the same water volume at a $+4^\circ\text{C}$ [19, 20].

The determination of the pH value was established by means of a portable pH meter directly in the processing valve.

Water content (W%) was established as a difference in according to the formula: $\text{Water}(\%) = 100\% - \text{DM}(\%)$ [1, 3].

Content in dry matter (DM%) was established through AOAC no. 925.23 method which is based on pre-dried dehydration in a Memmert UFE 700 forced air oven [2, 3].

The calculation relation was used to determine the non-fat dry matter (SNF) content: $\text{SNF}(\%) = \text{DM} - \text{Fat content}(\%)$ [21].

Total lipids content was quantified by the acid- butyrometric Gerber method (digestion of milk proteins with sulfuric acid followed by separation of lipids via centrifugation, under the influence of isoamyl alcohol and 65°C temperature) [10,11,12].

Total protein content was measured through the Schülitz titrimetric method: milk treatment with formaldehyde that locks the protein amino groups, followed by NaOH (0.143N) titration of the free carboxyl groups resulting in a direct value of protein percentage [13, 17].

Caciotta cheese-making technology. In order to obtain the desired product, the main operations were performed in the valve (fig. 1).



Fig. 1 Putting milk in the valve for pasteurization

In the first phase, after the introduction of the milk, it was pasteurized at 60°C for 30 minutes. After pasteurization, the milk was cooled to temperatures of 34°C for seeding with lactic cultures (Fig. 2).



Fig. 2 Checking the temperature for seeding with lactic cultures

After the addition of the cultures, a careful homogenization of the milk is carried out in order to incorporate them properly in the whole milk mass. The next step is to

coagulate the milk. For coagulation we used a chemosis, CHY-MAX® M Liquid containing an enzyme that coagulates milk, with a very high specificity on the kappa-casein it cleaves (the highest efficacy of coagulants used in cheese production), causing a very good curd. The very low proteolytic activity also has an important influence on the taste (less bitter taste) and on the texture of the cheeses (less crushing).

The time for proper coagulation of milk is 30 minutes (Fig. 3).



Fig. 3 Checking the curd before processing

After that the curd is processed, cut and processed until it reaches the size of a pea (fig. 4).



Fig. 4 Curd processing

After crushing, the curd is left to rest for 10 minutes, so that the stage of partial elimination of whey can be performed. After removing some of the whey, heat the curd to 43°C. Turn off the heat and mix for 45 minutes (fig. 5).



Fig. 5 The curd to be poured into molds

Before putting the curd into molds, the whey is removed (approximately 40%) after which, with the help of a scaffold, the curd is poured into cylindrical plastic molds.

After the forms have been filled for 20 minutes we press them and then they are turned over; In the first 60 minutes, the return is made every 10 minutes, followed by the return every 30 minutes for 2 hours (fig. 6).



Fig. 6 Turning the shapes with cheese

For 12 hours the molds are left at temperatures of 19-20°C and then the cheese is removed from the molds and placed in brine crates (12%) and stored at 10°C for 12 hours. After salting, the maturation stage takes place, which takes place at temperatures between 12 - 14°C and at a relative humidity of 85 - 90% for at least 10 days. The product we analyzed was matured for a period of 30 days. After maturation, the

product is vacuum packed, labeled and stored at 6°C (Fig. 7).



Fig. 7 The finished product - Caciotta

Qualitative determinations made on the finished product. Sensory and physico-chemical analyzes were performed for Caciotta cheese.

The points method was used to establish the qualitative parameters from a sensory point of view.

As regards the part of the physicochemical determinations, determinations were made to identify the water content (%), the dry matter content (%), the fat (%) and protein content (%), the salt content (%), and the pH value.

Regarding the determination of the dry matter content, it was determined by drying in the oven and the water level was determined by difference, using the same calculation formula as in the case of milk [8].

The principle of determining fat content consists in dissolving the protein with sulphuric acid, followed by separation of the cheese fat in a Van Gulik butyrometer by centrifugation, the separation being assisted by the addition of small quantity of amyl alcohol. The fat content is read directly on the butyrometer scale [1, 10].

Protein content was determined by measuring total nitrogen content (Kjeldahl method) and multiplying by 6.38 [6, 9].

The Volhard method was used to determine cheese salt in duplicate on the cheese (about 3 g), not a cheese + dissolver combo. In the presence of a known number of

moles of silver nitrate, cheeses were cooked and digested with nitric acid and potassium permanganate. The chloride in the sample is released by the acid digestion and reacts with the silver to generate AgCl. The remaining unreacted silver was back-titrated with potassium thiocyanate and a ferric ammonium indicator to estimate the salt level [9].

A pH meter (model WTW InoLab), with a glass probe, was used for determining cheese pH, which was measured by taking a cheese sample from the cheese block and inserting the pH probe into the cheese [15].

RESULTS AND DISCUSSIONS

The first determinations were made for raw milk. For density, the mean value was $1.0294 \pm 0.0001 \text{ g/cm}^3$, the variation limits being between 1.0291 g/cm^3 and 1.0297 g/cm^3 . Another parameter analyzed was the pH value of the milk parameter which was determined to establish its freshness. Regarding the pH value, the minimum value was 6.50 and the maximum reached a level of 6.60; the mean value was 6.58 ± 0.02 (Table 1).

Also for raw milk, determinations were made to determine the water content, a parameter for which the average value was $86.88 \pm 0.05\%$ with variation limits between 86.76% and 87.07% and a value of the coefficient of variation of 0.14% that impresses on the analyzed samples a very homogeneous character (%). Regarding the dry matter content, the average value was $13.12 \pm 0.05\%$ and the value of the coefficient of variation was 0.92%, the character studied being also very homogeneous. For the non-fat dry matter content, an average value of $8.87 \pm 0.04\%$ was obtained (Table 1).

The determinations made to highlight the fat content recorded an average value of $4.25 \pm 0.59\%$, the variation limits being between 4.21% and 4.27% and the value of the variation coefficient of 0.59%, which gives the analyzed batch a very good homogeneity. For the protein content the average value was $3.36 \pm 0.02\%$ and the homogeneity of the batch was also very good in this case (Table 1).

Table 1 Qualitative parameters of raw milk

Specification	N	$\bar{X} \pm s_{\bar{x}}$	V%	Min.	Max.
Density (g/cm ³)	5	1.0294±0.0001	0.02	1.0291	1.0297
pH value		6.58±0.02	0.68	6.5	6.6
Water (%)		86.88±0.05	0.14	86.76	87.07
Dry matter (DM) (%)		13.12±0.05	0.92	12.93	13.24
Non fat day matter (SUN) (%)		8.87±0.04	1.09	8.72	8.97
Fat (%)		4.25±0.59	0.59	4.21	4.27
Protein (%)		3.36±0.02	1.05	3.30	3.39

For the finished product, Caciotta cheese in the first phase was performed a sensory examination. The product was analyzed by a team of five tasters, each of them giving a maximum score for each characteristic pursued (Table 2).

Regarding the fat content, the limit values ranged between 28.41% and 29.01%, the average being 28.62±0.11%. The studied

character showed a very good homogeneity, the value of the coefficient of variation being 0.84%. Regarding the protein content, the average value was 19.63±0.08% with limits between 19.45% and 19.87%. the studied character showed a very good homogeneity, the value of the coefficient of variation being 0.95% (table 3).

Table 2 Caciotta cheese summary sheet

Nr. crt.	The name of the taster	Individual score (Is)					
		Exterior appearance	Color	Appearance in section	Consistency	Smell	Taste
1	Taster 1	5	5	5	5	5	5
2	Taster 2	5	5	5	5	5	5
3	Taster 3	5	5	5	5	5	5
4	Taster 4	5	5	5	5	5	5
5	Taster 5	5	5	5	5	5	5
Unweighted average score (Pmnp)		5	5	5	5	5	5
Weighted average score (Pmp)		2	2	4	4	2	6
Weighted total score		20					

Table 3 Qualitative parameters of Caciotta cheese

Specification	N	$\bar{X} \pm s_{\bar{x}}$	V%	Min.	Max.
Water (%)	5	47.84±0.08	0.37	47.55	48.01
Dry matter (DM) (%)		52.16±0.08	0.34	51.99	52.45
Fat (%)		28.62±0.11	0.84	28.41	29.01
Protein (%)		19.63±0.08	0.95	19.45	19.87
Salt content (%)		1.51±0.01	1.96	1.48	1.56
pH value		5.12±0.02	0.99	4.95	5.35

With a high impact on the quality of the finished product is the salt content, an index for which the average value was 1.51±0.01%, the minimum value being 1.48% and the maximum reaching a level of 1.56%. Regarding the studied character, it presented a very good homogeneity, the value of the coefficient of variation being 1.96 (table 3).

The last parameter analyzed was the pH value parameter for which the mean value was 5.12±0.02 and the value of the coefficient of variation was 0.99% (Table 3).

CONCLUSIONS

Caciotta cheese was made from whole cow's milk during the milk processing workshop. The analyzes carried out on the raw material milk showed that the raw material was of very good quality.

As for the milk processing part, it was performed in a double-jacket valve and the operations were performed manually.

After the sensory examination, Caciotta cheese obtained a score of 20 points, which places the product in a very good category.

After 30 days of maturation, determinations were made to establish the qualitative parameters, which showed a fat content of $28.62 \pm 0.11\%$ and a protein level of $19.63 \pm 0.08\%$.

Even though the product underwent a 12% brine prematurity phase for 12 hours, the salt level in the finished product averaged $1.51 \pm 0.01\%$.

Although this product is not well known in our country, we recommend that cheese manufacturers test it and place it on the consumer market.

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