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TRADITIONAL AND INDUSTRIAL DAIRY PRODUCTS: COMPARATIVE ASSESSMENT OF COMPOSITION, NUTRITIONAL QUALITY AND SAFETY

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Abstract

This study aimed to compare the compositional and microbiological characteristics of traditionally and industrially manufactured dairy products and to assess whether differences in production technology are reflected in analytically measurable quality parameters. The analysis is grounded in a technological distinction between traditional and industrial production methods and focuses on dairy products originating from the South-Muntenia region. A total of 90 independent biological samples were analyzed (n = 45 per production category), covering seven product types obtained from both cow and sheep milk. The methodology is based on physicochemical and microbiological analyses performed in a university laboratory, with the support of specialized laboratories, targeting parameters relevant to compositional quality, product safety, and processing-related differences. The main quantified differences showed that traditional products had higher mean values for fat (up to 411% higher in the case of standardized industrial ovine milk), protein, dry matter, acidity, total viable count, and Escherichia coli, whereas industrial products showed higher lactose values and more uniform microbiological profiles. From a food safety perspective, Salmonella spp. and Listeria monocytogenes were absent in all analyzed samples, and aflatoxin values were below the detection limit in all cases. These results suggest that production technology may influence the final quality characteristics of dairy products, with traditional products presenting a more concentrated compositional profile and a higher degree of microbiological variability, while industrial products are distinguished by greater standardization and more controlled hygiene parameters.

Key words: *consumer perception, microbiological quality, processing technologies, traditional versus industrial.*

INTRODUCTION

In recent years, traditional dairy products have remained highly relevant in consumer preferences, especially among consumers who associate them with authenticity, local cultural identity, and traditional processing practices.

At the same time, the development of industrial dairy processing has made it possible to obtain standardized products with relatively uniform characteristics and a high degree of technological control (Bichescu & Stanciu, 2017; Stefan (Vasiliu) et al., 2024).

The two production models, traditional and industrial, differ in the way raw materials are processed, in the technologies applied, and in the level of standardization, all of which can influence the physicochemical, microbiological, and sensory characteristics of the final products.

Consumer perceptions of traditional and industrial products are shaped by several subjective factors, including personal experience, cultural values, level of information, and marketing elements. Therefore, self-reported preferences do not always reflect the actual characteristics of the products. An objective comparison between these two categories requires measurable indicators that can highlight differences in composition, physicochemical profile, and microbiological quality. In dairy products, traditional processing can lead to greater variability in the characteristics of the final products. This variability may result from the composition of the raw material, the natural microflora, the processing techniques used, the maturation period, and the storage conditions. By contrast, industrial systems aim to obtain consistent quality by controlling raw materials,

standardizing technological parameters, and monitoring the production flow. These differences can be reflected in parameters such as fat, protein, lactose, dry matter, acidity, pH, and microbiological indicators.

The study aimed to compare the compositional and microbiological characteristics of traditional and industrial dairy products and to assess whether differences in production technology are reflected in analytically measurable quality parameters. The research focuses on identifying differences between the two production systems and on outlining general trends in the compositional, physicochemical, and microbiological safety profile of the analyzed products. The results were interpreted based on experimentally determined values and statistical processing, in order to assess how production technology is reflected in the final characteristics of dairy products.

MATERIALS AND METHODS

The research was designed as a comparative study aimed at evaluating the physicochemical, microbiological, and food safety characteristics of selected industrial and traditional dairy products. The purpose of the study was to identify compositional and microbiological differences between similar products, differentiated by production technology, namely industrial or traditional processing, as well as by the animal species from which the milk originated (Petrescu-Mag et al., 2017). The study was carried out between March and April 2026 on samples of fresh milk and finished dairy products collected from the counties of Argeș, Dâmbovița, and Prahova. Traditional samples were selected to reflect products commonly available through local households and agro-food markets. Industrial samples were selected from packaged and labeled products available in national retail chains. The analyzed products were selected from both industrial and traditional sources, in order to allow a comparison between similar product categories obtained through different production technologies. The biological material analyzed consisted of fresh milk and finished dairy products obtained from cow's milk and sheep's milk. The industrial products were represented by packaged and labeled products purchased from national retail chains and originating from authorized processors. The traditional products were represented by unlabeled products obtained from individual households and agro-food markets. The products were grouped according to product type, animal species of milk origin, and production technology. In total, 14 product-species-technology categories were analyzed, as presented in Table 1. For each product-species-technology category, the analysis was based on 45 independent biological samples. Each sample was collected from a distinct production unit or individual household, ensuring that the 45 values represent independent biological observations rather than technical replicates of the same product. Samples were collected from different producers and localities across the three counties. These values were used to calculate the mean, the measure of dispersion reported in the tables, and the statistical significance of the differences between industrial and traditional products. The products included in the study are listed in Table 1.

Table 1. Dairy products analyzed and sample organization according to animal species and production technology

No.	Product analyzed	Animal species of milk origin	Production technology	No. of samples
1.	Fresh milk	Cow	Industrial	45
2.	Fresh milk	Cow	Traditional	45
3.	Fresh milk	Sheep	Industrial	45
4.	Fresh milk	Sheep	Traditional	45
5.	Burduf cheese	Sheep	Industrial	45
6.	Burduf cheese	Sheep	Traditional	45
7.	Telemea cheese	Cow	Industrial	45
8.	Telemea cheese	Cow	Traditional	45
9.	Telemea cheese	Sheep	Industrial	45
10.	Telemea cheese	Sheep	Traditional	45
11.	Urda cheese	Cow	Industrial	45
12.	Urda cheese	Cow	Traditional	45
13.	Smoked caș cheese	Cow	Industrial	45
14.	Smoked caș cheese	Cow	Traditional	45

For each product category, physicochemical parameters, microbiological parameters, and food safety indicators were evaluated. The physicochemical parameters analyzed included density, fat content, protein content, lactose content, dry matter, acidity, and pH. The microbiological parameters included total viable count and *Escherichia coli.* In addition, food safety indicators were analyzed, namely the presence of *Listeria monocytogenes*, *Salmonella* spp., and aflatoxin content. For the fresh milk samples, somatic cell count, expressed as cells/mL, was also included as a specific indicator of raw material quality.

The analyses were carried out to characterize the physicochemical, microbiological, and food safety profile of the samples included in the study. Standard reference protocols for the examination of dairy products were followed where applicable (Wehr & Frank, 2004). Physicochemical analyses were performed using a MilkoScan FT+ Fourier Transform Infrared analyzer (Foss, Denmark) for lactose determination, a Fossomatic FC somatic cell counter (Foss, Denmark) for somatic cell count, and an ELISA kit for aflatoxin M1 determination, with a limit of detection of 0.005 µg/kg. Density was determined using calibrated lactodensimeters; fat content was measured using the Gerber method; protein content was determined by the Dumas combustion method; dry matter was determined by gravimetric oven-drying; acidity was determined by Thorner titration; and pH was measured using a calibrated digital pH meter. For each analyzed product, the values of the selected parameters were determined according to the specific nature of the product and their relevance for the comparison between industrial and traditional production technologies. The physicochemical parameters determined included density, fat content, protein content, lactose content, dry matter, acidity, and pH. These indicators were used to evaluate the compositional profile of the products and to identify differences associated with the raw material and the production technology.

The microbiological parameters analyzed included total viable count and *Escherichia coli,* in order to assess the microbial load of the products. In addition, food safety indicators were evaluated, namely the presence of *Listeria monocytogenes*, *Salmonella* spp., and aflatoxin content. In the case of fresh milk, somatic cell count was also included as a specific indicator of raw material quality. The results obtained were centralized for each product, animal species, and production technology. For the quantitative parameters, the values were expressed as mean values accompanied by standard deviation or standard error of the mean, depending on the table and the statistical analysis performed. For the microbiological and food safety parameters expressed qualitatively, the results were reported using terms such as "absent" when the investigated microorganism was not detected in the analyzed samples. In the case of aflatoxin, values below the limit of detection were reported accordingly as "below the limit of detection" and were not interpreted as absolute numerical values. The data organized in this way formed the basis of the comparative analysis between industrial and traditional products, with the aim of identifying compositional, physicochemical, and microbiological differences between the two technological categories. The analyses were performed in a university laboratory and in collaboration with specialized laboratories equipped with specific instruments for physicochemical, microbiological, and food safety determinations. The determinations were carried out using standard analytical methods applied to milk and dairy products, depending on the nature of each investigated parameter (Table 2). Total viable count was determined according to ISO 4833-1:2013; Escherichia coli was enumerated using ISO 16649-2:2001; Listeria monocytogenes was detected following ISO 11290-1:2017; and Salmonella spp. was detected according to ISO 6579-1:2017.

The quantitative results were expressed in units specific to each parameter: g/cm³ for density; percentages for fat, protein, lactose, and dry matter; degrees Thorner for acidity; pH units for the acidic or alkaline reaction of the product; CFU/g for microbiological determinations; and cells/mL for somatic cell count. The qualitative results regarding the presence of *Listeria monocytogenes* and *Salmonella* spp. were expressed as "absent" when the investigated microorganisms were not detected in the analyzed samples. Aflatoxin values below the limit of detection were reported as such and

were not interpreted as absolute numerical values. For each product-species-technology category, the results obtained from the 45 analyzed samples were centralized by calculating the mean value. This method of reporting allowed the characterization of the mean level of the investigated parameters, as well as the identification of the range of variation within each product category. In the case of *Escherichia coli,* results expressed as "absent" were considered as 0 CFU/g during statistical processing. For aflatoxin, values reported below the limit of detection were retained as such and were not converted into absolute numerical values.

Table 2. Analyzed parameters and methods used

Analyzed parameter	Method used
Density	Densimeter/lactodensimeter
Fat	Gerber method
Protein	Dumas
Lactose	FTIR/MilkoScan FT+ (Foss, Denmark)
Dry matter	Gravimetric oven-drying method
Acidity	Thorner titration
pH	Digital pH meter
TVC	ISO 4833 - plate inoculation, Plate Count Agar
Escherichia coli	ISO 16649
Listeria monocytogenes	ISO 11290
Salmonella spp.	ISO 6579
Aflatoxin	ELISA
Somatic cells	Fossomatic FC (Foss, Denmark)

Statistical analysis: The data obtained were statistically processed using Google Sheets. For each analyzed parameter, the arithmetic mean and standard deviation were calculated, and the comparison between industrial and traditional products was performed by determining the absolute and percentage differences between the mean values. Prior to group comparisons, the normality of the data distribution was verified using the Shapiro-Wilk test, and the homogeneity of variances was assessed using the Levene test. The comparison of means between industrial and traditional products was carried out using Welch's t-test (Welch, 1947), a variant of Student's t-test used to compare the means of two independent groups without assuming equal variances. The threshold for statistical significance was set at $p < 0.05$, while highly significant differences were reported as $p < 0.001$. Effect sizes were calculated using Cohen's d to assess the practical significance of the differences between groups. The 95% confidence intervals (95% CI) for the mean values were also calculated to quantify the precision of the estimates. Correlations were also analyzed between selected parameters considered relevant for the compositional and technological interpretation of the products, such as acidity-pH, acidity-lactose, dry matter-fat, and dry matter-protein. Pearson correlation coefficients (Pearson, 1895) were calculated between parameters relevant to the compositional, fermentative, and microbiological interpretation of the products. The statistical processing aimed to identify comparative trends between industrial and traditional products, both within each product category and across the entire set of analyzed products. Data processing was based on the results obtained from the analyses performed on the samples included in the study.

RESULTS AND DISCUSSIONS

The analysis of compositional parameters revealed clear differences between industrial and traditional dairy products (Table 3). This category included fat, protein, lactose, dry matter, and density.

The results show that traditional products had higher mean values for fat, protein, and dry matter in all seven pairs compared, with statistically significant differences. By contrast, lactose values were higher in industrial products in six of the seven comparisons, while density showed slightly higher values in industrial products in most cases, although the magnitude of these differences was limited.

Fat content was higher in traditional products across all analyzed pairs. The differences were highly statistically significant for all products, indicating a consistent tendency for traditional variants to have a more concentrated lipid profile. The largest percentage differences were observed in fresh sheep's milk, where the traditional variant had a much higher mean

value than the industrial one, namely 7.67% compared with 1.50%. This substantial difference (411%) is explained by the fact that the industrial sheep's milk analyzed was a commercially standardized product, subjected to fat-standardization processes that reduce the original lipid content to meet specific product specifications. Normal ovine milk fat content ranges between 6% and 9%, and the traditional samples fell within this expected range. The industrial product, in contrast, had undergone partial skimming and standardization prior to packaging, which accounts for the markedly reduced fat value. This difference therefore reflects a technological distinction rather than a biological anomaly. Relevant differences were also observed in sheep Telemea cheese, where the mean fat content was 27.43% in the traditional product compared with 21.77% in the industrial product, as well as in Burduf cheese, where the values were 32.37% in the traditional product and 28.47% in the industrial product. This trend suggests that the traditional products analyzed had a higher lipid content, possibly associated with the use of less standardized raw material and with technological processes that lead to a greater concentration of solid components.

Protein content followed the same direction as fat content, with mean values being higher in traditional products in all comparisons. The differences were highly statistically significant for all analyzed pairs. For example, traditional Burduf cheese had a mean protein content of 20.70%, compared with 19.50% in the industrial variant. In smoked caș cheese, the values were 19.20% for the traditional product and 18.40% for the industrial product, while in cow's milk Telemea cheese the values were 16.83% compared with 15.97%. Although the percentage differences for protein were more moderate than those observed for fat, the trend was consistent and supports the idea of a richer compositional profile in traditional products. This aspect is important because proteins represent one of the main indicators of the nutritional value of dairy products.

Dry matter was also higher in traditional products in all analyzed comparisons. The differences were highly statistically significant, confirming the general tendency toward compositional concentration in traditional products. The most evident differences were observed in fresh sheep's milk, where dry matter was 19.47% in the traditional variant and 11.80% in the industrial variant, as well as in Burduf cheese, where the values were 56.87% in the traditional product and 51.93% in the industrial product.

The higher dry matter values observed in traditional products are consistent with the higher fat and protein values. This result supports the hypothesis that the traditional products analyzed contained a higher proportion of solid components and, consequently, had a more pronounced nutritional density compared with industrial products.

Lactose showed a different trend compared with fat, protein, and dry matter. In six of the seven comparisons, mean lactose values were higher in industrial products. The differences were highly statistically significant for all analyzed pairs. This trend is particularly evident in fermented or processed products, such as Burduf cheese, smoked caș cheese, Telemea cheese, and Urda cheese. For example, in sheep's milk Burduf cheese, mean lactose content was 0.50% in the industrial product and 0.30% in the traditional product. In smoked caș cheese, the values were 1.50% in the industrial product and 1.03% in the traditional product, while in sheep's milk Telemea cheese they were 1.20% compared with 0.93%. The lower lactose values observed in traditional products may be associated with more intense fermentative activity, in which lactose is used as a substrate by lactic microflora. The only exception was fresh cow's milk, where lactose was slightly higher in the traditional variant. This difference was limited in magnitude and should be interpreted in the context of the natural variability of raw milk and the standardization of industrial products.

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Table 3. Compositional parameters

Parameter	Product	Species	Industrial	Traditional	Dif. T vs I%	p-value	Statistical significance
Density (g/cm^3)	Burduf cheese	Sheep	1.0810 ± 0.0017	1.0805 ± 0.0021	-0.05%	p = 0.218	NS
	Smoked caș cheese	Cow	1.0585 ± 0.0003	1.0560 ± 0.0007	-0.24%	p < 0,01	**
	Fresh milk	Sheep	1.0360 ± 0.0007	1.0345 ± 0.0008	-0.14%	p < 0,05	*
	Fresh milk	Cow	1.0290 ± 0.0006	1.0290 ± 0.0011	0.00%	p = 1.000	NS
	Telemea cheese	Sheep	1.0740 ± 0.0008	1.0730 ± 0.0010	-0.09%	p = 0.10	NS
	Telemea cheese	Cow	1.0645 ± 0.0009	1.0635 ± 0.0009	-0.09%	p =0.110	NS
	Urda cheese	Cow	1.0450 ± 0.0006	1.0435 ± 0.0003	-0.14%	p < 0,05	*
Fat (%)	Burduf cheese	Sheep	28.47 ± 0.240	32.37 ± 0.530	13.70%	p < 0,001	***
	Smoked caș cheese	Cow	21.90 ± 0.111	24.67 ± 0.423	12.65%	p < 0,001	***
	Fresh milk	Sheep	1.50 ± 0.030	7.67 ± 0.215	411.33%	p < 0,001	***
	Fresh milk	Cow	3.67 ± 0.113	3.97 ± 0.078	8.17%	p < 0,001	***
	Telemea cheese	Sheep	21.77 ± 0.516	27.43 ± 0.522	26.00%	p < 0,001	***
	Telemea cheese	Cow	19.40 ± 1.107	21.43 ± 0.476	10.46%	p < 0,001	***
	Urda cheese	Cow	4.40 ± 0.141	6.10 ± 0.157	38.64%	p < 0,001	***
Lactose (%)	Burduf cheese	Sheep	0.50 ± 0.067	0.30 ± 0.071	-40.00%	p < 0,001	***
	Smoked caș cheese	Cow	1.50 ± 0.067	1.03 ± 0.087	-31.32%	p < 0,001	***
	Fresh milk	Sheep	4.50 ± 0.030	4.40 ± 0.060	-2.22%	p < 0,001	***
	Fresh milk	Cow	4.60 ± 0.060	4.67 ± 0.021	1.50%	p < 0,001	***
	Telemea cheese	Sheep	1.20 ± 0.074	0.93 ± 0.085	-22.50%	p < 0,001	***
	Telemea cheese	Cow	1.80 ± 0.060	1.53 ± 0.075	-15.00%	p < 0,001	***
	Urda cheese	Cow	3.27 ± 0.076	2.80 ± 0.077	-14.37%	p < 0,001	***
Protein (%)	Burduf cheese	Sheep	19.50 ± 0.171	20.70 ± 0.380	6.15%	p < 0,001	***
	Smoked caș cheese	Cow	18.40 ± 0.098	19.20 ± 0.242	4.35%	p < 0,001	***
	Fresh milk	Sheep	5.60 ± 0.064	5.80 ± 0.052	3.57%	p < 0,001	***
	Fresh milk	Cow	3.27 ± 0.019	3.37 ± 0.020	3.05%	p < 0,001	***
	Telemea cheese	Sheep	18.27 ± 0.108	19.13 ± 0.299	4.71%	p < 0,001	***
	Telemea cheese	Cow	15.97 ± 0.190	16.83 ± 0.200	5.39%	p < 0,001	***
	Urda cheese	Cow	12.53 ± 0.134	13.20 ± 0.158	5.35%	p < 0,001	***
Dry Matter (%)	Burduf cheese	Sheep	51.93 ± 0.265	56.87 ± 0.819	9.51%	p < 0,001	***
	Smoked caș cheese	Cow	46.40 ± 0.177	49.60 ± 0.484	6.90%	p < 0,001	***
	Fresh milk	Sheep	11.80 ± 0.165	19.47 ± 0.196	65.00%	p < 0,001	***
	Fresh milk	Cow	12.20 ± 0.060	12.87 ± 0.156	5.49%	p < 0,001	***
	Telemea cheese	Sheep	48.50 ± 0.220	51.77 ± 0.600	6.74%	p < 0,001	***
	Telemea cheese	Cow	40.87 ± 1.038	42.83 ± 0.527	4.80%	p < 0,001	***
	Urda cheese	Cow	22.53 ± 0.131	24.57 ± 0.342	9.05%	p < 0,001	***

NS – non-significant differences between means ($p > 0.05$); * – significant differences ($p < 0.05$); ** – distinctly significant differences ($p < 0.01$); *** – highly significant differences ($p < 0.001$).

In smoked caș cheese, the values were 1.50% in the industrial product and 1.03% in the traditional product, while in sheep's milk Telemea cheese they were 1.20% compared with 0.93%. The lower lactose values observed in traditional products may be associated with more intense fermentative activity, in which lactose is used as a substrate by lactic microflora. The only exception was fresh cow's milk, where lactose was slightly higher in the traditional variant. This difference was limited in magnitude and should be interpreted in the context of the natural variability of raw milk and the standardization of industrial products.

Density was practically identical between the two systems in cow's milk ($p = 1.000$), while a statistically significant difference was observed in sheep's milk (-0.14%, $p < 0.05$). This suggests that the basic parameters of raw milk are relatively uniform regardless of origin, whether industrial or traditional, and that collection and standardization processes reduce natural variability.

In semi-hard and hard cheeses, such as Telemea cheese and Burduf cheese, the differences were small, ranging from -0.05% to -0.09%, and were not statistically significant. This indicates that the manufacturing technologies used for these products are sufficiently standardized in both systems, leading to products with similar physical characteristics. Products with statistically significant differences included smoked caș cheese and Urda cheese, which are associated with less rigid manufacturing processes in traditional production, such as artisanal smoking, variability in whey drainage time (Scarlat et al., 2025), and less controlled processing temperatures. The lower density observed in the traditional variants may reflect a slightly higher water content or a less compact structure, resulting from less uniform manual processing. Therefore, density may be considered an auxiliary physicochemical parameter, useful for the general characterization of the products, but less relevant as a main indicator of compositional differences between industrial and traditional dairy products.

Overall, the analysis of compositional parameters shows that the traditional products analyzed had a more concentrated profile, reflected in higher values of fat, protein, and dry matter. By contrast, industrial products generally showed higher lactose values, which may reflect lower fermentative activity or a higher degree of technological standardization. These results support the idea that the differences between industrial and traditional products are not only technological or commercial in nature, but are directly reflected in the physicochemical composition of the analyzed products.

The analysis of acidity and pH highlights a clear differentiation between industrial and traditional dairy products (Table 4). In all seven analyzed pairs, traditional products showed higher mean acidity values compared with industrial products, and the differences were statistically significant. This trend was observed both in fresh milk and in processed products, such as Burduf cheese, Telemea cheese, smoked caș cheese, and Urda cheese. The largest absolute differences in acidity were recorded in sheep's milk Burduf cheese, where the traditional product had a mean acidity of 207.00°T, compared with 178.33°T in the industrial product. Important differences were also observed in sheep's milk Telemea cheese, with 158.67°T in the traditional variant and 139.67°T in the industrial variant, as well as in cow's milk Telemea cheese, where acidity was 123.33°T in the traditional product and 110.00°T in the industrial product. These results indicate a consistent tendency for traditional products to show a higher level of acidity.

At the same time, pH values followed an opposite trend (Table 4). Industrial products showed higher mean pH values in all comparisons, which means that traditional products had a more acidic character. For example, in Burduf cheese, the mean pH was 4.72 in the industrial product and 4.58 in the traditional product. In cow's milk Telemea cheese, the values were 5.16 for the industrial product and 4.97 for the traditional product, while in smoked caș cheese, pH was 5.46 in the industrial variant and 5.26 in the traditional variant. This relationship between acidity and pH is consistent from a physicochemical perspective. An increase in acidity is generally accompanied by a decrease in pH, reflecting the accumulation of acidic compounds formed during fermentative processes.

In the traditional products analyzed, the higher acidity values and lower pH values may suggest more intense fermentative activity or a lower degree of standardization in the technological process. The relationship with lactose supports this interpretation. In six of the seven analyzed pairs, industrial products showed higher lactose values than traditional products. This trend is important because lactose is the main fermentable substrate in milk. The reduction in lactose content observed in traditional products, together with higher acidity and lower pH, may indicate a more pronounced conversion of lactose into organic acids, especially lactic acid.

Table 4. Relationship between acidity, pH, and lactose in the analyzed products

Product	Species	Acidity I (°T)	Acidity T (°T)	pH I	pH T	Lactose I (%)	Lactose T (%)	Observed relationship
Burduf cheese	Sheep	178.33	207.00	4.72	4.58	0.50	0.30	T: acidity ↑, pH ↓, lactose ↓
Smoked caș cheese	Cow	84.33	94.00	5.46	5.26	1.50	01.03	T: acidity ↑, pH ↓, lactose ↓
Fresh milk	Sheep	21.17	23.33	6.51	6.44	4.50	4.40	T: acidity ↑, pH ↓, lactose ↓
Fresh milk	Cow	16.67	18.17	6.65	6.56	4.60	4.67	T: acidity ↑, pH ↓, lactose ↑
Telemea cheese	Sheep	139.67	158.67	4.90	4.76	1.20	0.93	T: acidity ↑, pH ↓, lactose ↓
Telemea cheese	Cow	110.00	123.33	5.16	4.97	1.80	1.53	T: acidity ↑, pH ↓, lactose ↓
Urda cheese	Cow	44.00	54.00	6.16	5.96	3.27	2.80	T: acidity ↑, pH ↓, lactose ↓

Note: I = industrial product; T = traditional product; ↑ = higher value; ↓ = lower value.

As shown in Table 4, traditional products exhibited higher acidity and lower pH values in all analyzed pairs. In most cases, this relationship was accompanied by lower lactose values, supporting the hypothesis of a more pronounced fermentative profile. The exception was fresh cow's milk, where lactose was slightly higher in the traditional variant, without altering the overall trend regarding acidity and pH. This observation is more evident in fermented or ripened products. In burduf cheese, lactose was lower in the traditional product, namely 0.30%, compared with 0.50% in the industrial product. In smoked caș cheese, lactose was 1.03% in the traditional product and 1.50% in the industrial one, while in sheep telemea cheese the values were 0.93% and 1.20%, respectively. These differences, correlated with higher acidity and lower pH, support the existence of a more pronounced fermentative profile in traditional products. Therefore, the obtained data indicate a logical relationship among the three indicators: higher acidity, lower pH, and lower lactose content. This combination is characteristic of products in which fermentative processes are more pronounced. In traditional products, this profile may be associated both with the use of a more diverse natural microflora and with less standardized technological control compared with industrial production.

Overall, the results regarding acidity, pH, and lactose highlight the existence of consistent physicochemical differences between traditional and industrial dairy products. Traditional products showed higher acidity values and lower pH values in all analyzed pairs, and in most cases, they also had a lower lactose content. This association between higher acidity, lower pH, and reduced lactose suggests a more pronounced fermentative profile of traditional products. This interpretation is supported by the fact that lactose is the main fermentable substrate in milk, and its reduction, together with increased acidity, may indicate a more intense conversion into acidic compounds, particularly lactic acid. Therefore, the analyzed traditional products appear to reflect more active or less standardized fermentative processes compared with industrial products. However, this interpretation should be made with caution, as fermentation intensity was not measured directly, but inferred based on the relationship among the analyzed parameters. The observed differences may also be influenced by other factors, such as the quality and composition of the raw material, specific microflora, ripening duration, storage conditions, and the particularities of the technological process. Thus, the data support the existence of a more pronounced acidic and fermentative profile in traditional products, without allowing these differences to be attributed exclusively to a single technological factor.

The microbiological and food safety analysis aimed to highlight the differences between industrial and traditional dairy products from the perspective of the overall microbial load, hygiene indicators, and food safety indicators. This section analyzes the results regarding the total viable count, *Escherichia coli,* somatic cell count, as well as the safety indicators represented by *Salmonella* spp., *Listeria monocytogenes*, and aflatoxin.

Table 5. Comparison of microbiological, hygiene, and food safety indicators in industrial and traditional dairy products

Parameter	Product	Species	Industrial, mean ± SEM	Traditional, mean ± SEM	Absolute difference	Difference, %	p	Trend
TVC	Burduf cheese	Sheep	41333 ± 4008	135000 ± 14746	93667	226.62%	$p < 0.001$	T > I
TVC	Smoked caş cheese	Cow	19667 ± 1947	70333 ± 7142	50666	257.62%	$p < 0.001$	T > I
TVC	Fresh milk	Sheep	28333 ± 3582	115000 ± 16619	86667	305.89%	$p < 0.001$	T > I
TVC	Fresh milk	Cow	14333 ± 1998	59333 ± 7987	45000	313.96%	$p < 0.001$	T > I
TVC	Telemea cheese	Sheep	28333 ± 2191	105026 ± 8923	76693	270.68%	$p < 0.001$	T > I
TVC	Telemea cheese	Cow	22667 ± 2004	79333 ± 6955	56666	249.99%	$p < 0.001$	T > I
TVC	Urda cheese	Cow	3633 ± 530	7933 ± 899	4300	118.36%	$p < 0.001$	T > I
E. coli	Burduf cheese	Sheep	3.33 ± 2.14	35.00 ± 11.58	31.67	950.00%	$p < 0.001$	T > I
E. coli	Smoked caş cheese	Cow	3.33 ± 2.08	15.00 ± 2.86	11.67	350.00%	$p < 0.001$	T > I
E. coli	Fresh milk	Sheep	3.33 ± 2.07	30.00 ± 8.19	26.67	800.00%	$p < 0.001$	T > I
E. coli	Fresh milk	Cow	0.00 ± 0.00	13.33 ± 4.78	13.33	NA	$p < 0.001$	T > I
E. coli	Telemea cheese	Sheep	5.00 ± 2.77	31.67 ± 4.76	26.67	533.40%	$p < 0.001$	T > I
E. coli	Telemea cheese	Cow	3.33 ± 2.07	26.67 ± 7.14	23.34	700.10%	$p < 0.001$	T > I
E. coli	Urda cheese	Cow	3.33 ± 2.12	8.33 ± 3.09	5	150.00%	$p < 0.001$	T > I
SCC	Fresh milk	Sheep	398333 ± 8091	583333 ± 39500	185000	46.44%	$p < 0.001$	T > I
SCC	Fresh milk	Cow	196667 ± 7191	336667 ± 27016	140000	71.19%	$p < 0.001$	T > I

The total viable count was higher in traditional products in all analyzed pairs, with the differences compared with industrial products being statistically significant, as shown in Table 5. This trend indicates a higher overall microbial load in products obtained by traditional methods. The largest differences were observed in sheep burduf cheese, where the traditional product recorded a mean value of 135,000 CFU/g, compared with 41,333 CFU/g in the industrial product. Important differences were also identified in fresh sheep milk, with 115,000 CFU/g in the traditional variant and 28,333 CFU/g in the industrial one, as well as in sheep telemea cheese, where the values were 105,025.91 CFU/g for the traditional product and 28,333 CFU/g for the industrial product. The higher TVC values in traditional products may be associated with the particularities of traditional processing, the use of a more diverse natural microflora, and a lower degree of standardization of production, handling, and storage conditions. By contrast, the lower values observed in industrial products may reflect stricter technological control and more standardized processing conditions. However, TVC should be interpreted as an indicator of the overall microbial load and not as a direct indicator of the presence of pathogenic microorganisms. In fermented dairy products, a higher microbial load may also include the flora specific to fermentative processes; therefore, the interpretation of this parameter should be correlated with the other microbiological and food safety indicators analyzed.

The values obtained for *Escherichia coli* highlighted clear differences between industrial and traditional products. In all analyzed pairs, traditional products showed higher mean values compared with industrial products, with the differences being statistically significant. The largest differences were observed in sheep burduf cheese, where the traditional product recorded a mean value of 35.00 CFU/g, compared with 3.33 CFU/g in the industrial product. Higher values were also observed in sheep telemea cheese, with 31.67 CFU/g in the traditional variant and 5.00 CFU/g in the industrial variant, as well as in fresh sheep milk, where the mean value was 30.00 CFU/g for the traditional product and 3.33 CFU/g for the industrial product. The presence of higher

Escherichia coli values in traditional products may indicate greater variability in hygiene-related conditions associated with processing, handling, or storage. Unlike industrial products, where the technological process is more standardized and controlled, traditional products may more strongly reflect the influence of local production conditions and hygiene practices. However, these results should be interpreted with caution. The values obtained for *Escherichia coli* are indicators of hygiene-related quality, not direct evidence of the presence of specific pathogenic agents. Therefore, the observed differences indicate a higher hygiene-related microbiological load in traditional products, without allowing a general conclusion to be drawn regarding the safety of all products in this category. The somatic cell count was analyzed only in fresh milk samples, as it is a relevant indicator for assessing the quality of the raw material. The results showed higher values in traditional fresh milk compared with industrial fresh milk, both for cow's milk and sheep's milk, with the differences being statistically significant. In fresh cow's milk, the mean SCC value was 336,667 cells/ml in the traditional variant, compared with 196,667 cells/ml in the industrial variant. For fresh sheep's milk, the difference was also evident, with a mean value of 583,333 cells/ml in the traditional product, compared with 398,333 cells/ml in the industrial product. The higher somatic cell count values in traditional milk may reflect greater variability in raw material quality, associated with differences in the physiological status of the animals, milking hygiene, collection conditions, and the level of control applied before processing. In industrial products, the lower values may be correlated with standardized collection, selection of raw material, and the application of more rigorous controls throughout the production chain. Therefore, the SCC results support the distinction between a more controlled industrial system and a more variable traditional system, without allowing direct conclusions to be drawn regarding the health status of the animals or the overall quality of all products obtained from traditional sources.

In addition to the quantitative microbiological indicators, food safety indicators were also analyzed, namely *Salmonella* spp., *Listeria monocytogenes*, and aflatoxin. These parameters were treated separately from TVC, *Escherichia coli,* and SCC, because the results were expressed predominantly qualitatively or in relation to the limit of detection. For *Salmonella* spp. and *Listeria monocytogenes*, the results indicated the absence of these microorganisms in the analyzed samples. This represents a favorable result from a food safety perspective, as these two agents are considered important indicators for assessing microbiological risks associated with food products, in accordance with the microbiological criteria established by European Commission (2005). In the case of aflatoxin, values reported below the limit of detection were retained as such and were not included in the calculation of the standard deviation or coefficient of variation. The maximum permissible levels for aflatoxins in dairy products are established by European Commission (2023). This approach was necessary because results expressed as "below the limit of detection" do not represent absolute numerical values, but indicate that the determined level was below the quantification capacity of the method used. Therefore, in the analyzed samples, the food safety indicators did not reveal relevant contamination with *Salmonella* spp. or *Listeria monocytogenes*, while aflatoxin was treated as a parameter reported in relation to the limit of detection. These results complement the general microbiological analysis, providing an additional perspective on the hygiene and safety profile of the investigated products.

The microbiological analysis highlighted higher TVC and *Escherichia coli* values in traditional products across all compared pairs, indicating a higher microbial load and a more variable hygiene and safety profile compared with industrial products. In the case of fresh milk, the higher somatic cell count values in the traditional variants also suggest greater variability in raw material quality. These results may be associated with the particularities of traditional processing, a more diverse natural microflora, and a lower degree of standardization of production, handling, and storage conditions. However, higher values of microbiological indicators should not be automatically interpreted as a lack of food

safety, especially in the case of fermented products. The absence of *Salmonella* spp. and *Listeria monocytogenes* in the analyzed samples represents a favorable result from a food safety perspective. Therefore, the analyzed traditional products present a higher and more variable microbiological profile, whereas industrial products reflect a higher level of standardization and food safety control.

The comparative analysis of industrial and traditional dairy products revealed clear differences between the two technological categories for most of the investigated parameters. The synthesized results show that traditional products presented higher mean values for acidity, fat, protein, dry matter, total viable count, *Escherichia coli,* and somatic cell count, whereas industrial products recorded higher values for pH, lactose, and, in most comparisons, density. The Pearson correlations calculated between selected parameters are summarized in Table 6.

Table 6. Summary of Pearson correlations among relevant compositional, fermentative, and microbiological parameters

Analyzed relationship	No. of correlations	Pearson r range	Predominant type of correlation	Interpretative relevance
Acidity - pH	14	-0.350 – 0.276	weak/variable	Relationship evident at the level of comparative means, but weak within groups
Acidity - Lactose	14	-0.176 – 0.226	weak/variable	Cautiously supports the fermentative interpretation
Dry matter - Fat	14	-0.289 – 0.234	weak/variable	Associates solid components with fat content
Dry matter - Protein	14	-0.330 – 0.295	weak/variable	Associates dry matter with protein content
TVC - *E. coli*	14	-0.200 – 0.137	weak/variable	Associates TVC with the hygiene-related indicator

Note: Pearson's r indicates the direction and strength of the linear relations between the analyzed parameters. Positive values indicate a direct relationship, while negative values indicate an inverse relationship.

The calculated correlations revealed variable relationships among the analyzed parameters. In particular, the acidity-pH and acidity–lactose relationships were generally weak within each product-species-technology category, indicating that the trends observed at the level of comparative means are not always expressed as strong linear relationships within groups. Therefore, Pearson correlations were used as a complementary interpretative tool, rather than as the sole argument for explaining the differences between industrial and traditional products.

Discussion: The results obtained allow clear differences to be outlined between industrial and traditional dairy products from compositional, physicochemical, and microbiological perspectives. The comparative analysis showed that traditional products generally presented higher values of fat, protein, and dry matter, suggesting a more concentrated compositional profile compared with industrial products. This tendency was consistent across all analyzed pairs and was statistically supported. From the perspective of physicochemical parameters, traditional products recorded higher acidity and lower pH values, and in most cases had a lower lactose content. The association between increased acidity, reduced pH, and lower lactose indicates a profile compatible with more pronounced fermentative processes. However, this interpretation should be viewed with caution, as fermentation intensity was not measured directly, but inferred based on the relationship among the analyzed parameters. From a microbiological perspective, traditional products showed higher TVC and *Escherichia coli* values, while in the case of fresh milk, higher somatic cell count values were observed. These results suggest a higher microbial load and greater hygiene-related variability in traditional products. By contrast, industrial products showed a more controlled profile, an aspect that may be associated with the standardization of technological processes, raw material control, and more rigorous processing conditions. The overall interpretation of the results indicates the existence of a dual profile of traditional products. On the one hand, traditional products stand out through a richer compositional profile, supported by higher values of fat, protein, and dry matter, suggesting a higher concentration of nutritional

components. The microbiological richness of traditional products, reflected in higher total viable count values, may also indicate a more diverse natural microbial community, including lactic acid bacteria with potential probiotic properties. Additionally, traditional products carry recognized cultural, heritage, and sensory value, being strongly associated with local identity and specific production practices. On the other hand, the higher values of microbiological indicators, including Escherichia coli and total viable count, and the higher somatic cell count in traditional milk, highlight the need for careful hygiene and safety control during production, handling, and commercialization. The greater variability in composition observed in traditional products is an inherent consequence of less standardized raw materials and technologies. Industrial products are characterized by a higher degree of standardization, a more controlled microbiological profile, and greater uniformity, which are clear advantages from the perspective of large-scale food safety management. Therefore, the differences between industrial and traditional products should not be interpreted unilaterally, in terms of the absolute superiority of one category over the other. Traditional products can be valued for their compositional density, technological specificity, and fermentative profile that may suggest more active microbial communities; whereas industrial products are distinguished by uniformity, predictability, and hygiene-related stability. The present study has several limitations that should be acknowledged. The samples were collected exclusively from the South-Muntenia region (counties of Argeș, Dâmbovița, and Prahova) during a limited time period (March-April 2026), and the results may not reflect the diversity of traditional dairy systems across different geographic areas, production seasons, or agro-climatic conditions. The study was observational in design; therefore, no causal inferences can be drawn regarding the mechanisms underlying the observed differences. Furthermore, the microbiological profile of the products was characterized only in terms of total viable count and selected hygiene and safety indicators; a comprehensive characterization of the microbial communities, for example through metagenomics, was beyond the scope of the present work. Overall, the results support the idea that the two product categories have distinct profiles, and their evaluation should be carried out in an integrated manner, by correlating compositional, physicochemical, microbiological, and statistical parameters.

This distribution of results indicates the existence of two distinct profiles. On the one hand, traditional products stand out through a more concentrated compositional profile, supported by higher values of fat, protein, and dry matter. On the other hand, they present higher acidity values and lower pH values, suggesting a more pronounced fermentative character compared with industrial products. The obtained results are in line with observations reported in recent literature regarding the influence of the production system on the compositional and microbiological characteristics of dairy products. In the present study, traditional products generally showed higher values of fat, protein, dry matter, and acidity, as well as lower values of pH and lactose, suggesting a more concentrated compositional profile and a fermentative evolution that may be more pronounced compared with industrial products, although this interpretation should be viewed with caution as fermentation intensity was not measured directly. This tendency is close to the conclusions formulated by Maciuc et al. (2024), who highlighted that cheeses obtained under the "mountain product" quality scheme presented favorable nutritional differences compared with conventional products, particularly through a higher content of minerals and polyunsaturated fatty acids. Although the axis of comparison is not identical, namely traditional–industrial in the present study and mountain product–conventional in the cited study, both studies support the idea that less standardized production systems, or systems closer to the traditional model, may lead to nutritional differentiation in dairy products. From a microbiological perspective, traditional products showed higher values of total viable count and *Escherichia coli* in all comparisons performed. This tendency may be associated with a lower degree of technological standardization, the particularities of traditional processing, and variations in handling, hygiene,

and storage conditions. At the same time, these results should be interpreted in the context of the nature of the analyzed products, without automatically equating higher microbial load values with a lack of food safety. The higher values of total viable count and *Escherichia coli,* without evidence of contamination with *Salmonella spp*. or *Listeria monocytogenes*, can be compared with the results reported by Di Cerbo et al. (2020) for "Burrata di Andria" PGI, where the authors found the absence of *Salmonella* spp. and *Listeria monocytogenes*, but observed differences in microbiological load, including *Escherichia coli,* depending on the use of raw or pasteurized milk. Similarly to the Italian study, the results obtained in the present research indicate that a higher microbiological load should not be automatically interpreted as a lack of food safety, but should be analyzed in relation to the nature of the product, the production technology, the degree of standardization, and the specific food safety indicators.

Therefore, comparing the present results with those reported by Maciuc et al. (2024) and Di Cerbo et al. (2020) supports the conclusion that dairy products obtained through traditional, artisanal, or less standardized systems may have a more intensely expressed compositional profile, but also greater microbiological variability, which requires the simultaneous interpretation of nutritional, fermentative, and hygiene and safety parameters. From the perspective of statistical significance, most differences between industrial and traditional products were statistically significant, with the threshold used for interpretation being $p < 0.05$. For most of the analyzed parameters, the differences were reported at $p < 0.001$, indicating a consistent separation between the two product categories. However, in the case of density, although some differences were statistically significant, their magnitude was small, suggesting more limited practical relevance compared with parameters such as fat, dry matter, acidity, or microbiological indicators.

Overall, the results support the fact that the analyzed traditional products present a more intensely expressed compositional and fermentative profile, whereas industrial products are characterized by a more standardized profile and lower values of the analyzed microbiological indicators. This synthesis integrates the main findings obtained from the detailed analysis of the compositional, physicochemical, and microbiological parameters.

The results obtained in the present study are consistent with findings reported in studies that compared raw-milk, traditional, or artisanal cheeses with products obtained under more controlled technological conditions. Rashtchi et al. (2021), in their study on raw and pasteurized Lighvan cheeses during ripening, showed that the use of raw milk was associated with more intense microbial and sensory characteristics, but also with higher levels of hygiene-related microorganisms, including coliforms and Escherichia coli. This observation is comparable to the present results, where traditional dairy products showed higher total viable count and Escherichia coli values than industrial products, suggesting greater microbiological variability in less standardized production systems. At the same time, the lower lactose values, higher acidity, and lower pH observed in traditional products in the present study support the interpretation of a more pronounced fermentative profile, similar to the differences reported between raw and pasteurized cheese systems.

A similar interpretation can be made in relation to the study by Pappa et al. (2022), who analyzed traditional hard Xinotyri cheese produced from raw or pasteurized goat milk. Their results emphasized the role of natural microbiota and ripening in shaping the microbiological and biochemical characteristics of traditional cheese.

In the present study, the higher acidity and lower pH values observed in traditional products, together with the reduction in lactose in most comparisons, suggest that traditional processing may favor a more active or less standardized fermentative evolution. However, as in the case of Xinotyri cheese, these differences should be interpreted in relation to product type, raw material, technological practices, and storage or ripening conditions. The findings are also supported by the recent characterization of traditional Sicilian Canestrato Fresco cheese reported by Pisana et al. (2025), who described a traditional raw cow's milk cheese produced by

artisanal methods and characterized by a rich microbiological profile, with high levels of lactic acid bacteria.

This perspective is relevant for the present study because it supports the idea that traditional dairy products may have a more complex microbiological profile, which can contribute to their specific compositional and fermentative characteristics. Nevertheless, this greater microbiological complexity must be interpreted together with hygiene and food safety indicators. In the present study, although traditional products had higher TVC and *Escherichia coli* values, *Salmonella* spp. and *Listeria monocytogenes* were absent in all samples, and aflatoxin values were below the detection limit. Therefore, the comparison with these studies supports the main conclusion that traditional dairy products should not be evaluated as simply superior or inferior to industrial products, but as products with a distinct profile: richer in composition, more expressive from a fermentative point of view, but also more variable microbiologically.

CONCLUSIONS

The results obtained highlight the existence of two distinct profiles of the analyzed dairy products, differentiated by production technology. Traditional products stood out through a more concentrated compositional profile, supported by higher mean values of fat, protein, and dry matter in all analyzed pairs. These characteristics indicate a higher concentration of nutritional components and reflect the influence of the raw material, natural microflora, and the particularities of traditional processing.

At the same time, traditional products showed a physicochemical profile compatible with more pronounced fermentative processes, expressed through higher acidity, lower pH, and, in most cases, lower lactose content. By comparison, industrial products were distinguished by a more standardized and controlled profile, reflected in the uniformity of the analyzed parameters and lower values of microbiological indicators, particularly TVC and *Escherichia coli.*

The statistical analysis confirmed the existence of significant differences between industrial and traditional products for most of the analyzed parameters, supporting the trends observed descriptively. However, the interpretation of these differences should be made by correlating statistical significance with the practical and technological relevance of each parameter.

The traditional and industrial dairy products should not be interpreted in terms of absolute superiority, but rather as products with different profiles. Traditional products are characterized by compositional complexity and a fermentative profile that may suggest more active microbial communities, whereas industrial products stand out through uniformity, predictability, and more rigorous microbiological control. This synthesis brings together the main findings obtained from the detailed analysis of the compositional, physicochemical, and microbiological parameters and highlights the overall differences between industrial and traditional dairy products. The present study has several limitations that should be considered when interpreting the results. Sample collection was limited to one Romanian region (South-Muntenia: Argeș, Dâmbovița, and Prahova counties) during a restricted time period, and the findings may not be generalizable to the full diversity of traditional dairy production systems in Romania or other geographic areas. The observational design of the study does not allow causal relationships between production technology and product characteristics to be established. In addition, the microbiological community of the products was not comprehensively characterized, as metagenomics or culture-independent methods were not applied. Future research should consider a wider geographic and seasonal sampling strategy, the integration of metagenomic analyses for the characterization of the microbial communities of traditional dairy products, sensory analysis with trained panels, fatty acid profiling including conjugated linoleic acid, and longitudinal studies across production seasons to better capture the natural variability of traditional production systems.

REFERENCES

Bichescu, C. I., & Stanciu, S. (2017). Made in Romania. Traditional food products. *Cross Cultural Journal, XI*(1), 29–38.

Di Cerbo, A., Miraglia, D., Marino, L., Stocchi, R., Loschi, A. R., Fisichella, S., Cammertoni, N.,

Menchetti, L., Farneti, S., Ranucci, D., Branciari, R., & Rea, S. (2020). "Burrata di Andria" PGI cheese: Physicochemical and microbiological features. *Foods, 9*(11), 1694. https://doi.org/10.3390/foods9111694

European Commission. (2005). Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs. *Official Journal of the European Union, L338*, 1–26.

European Commission. (2023). Commission Regulation (EU) 2023/915 of 25 April 2023 on maximum levels for certain contaminants in food and repealing Regulation (EC) No 1881/2006. *Official Journal of the European Union, L119*, 103–157.

International Organization for Standardization. (2001). *Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of beta-glucuronidase-positive Escherichia coli - Part 2: Colony-count technique at 44 °C using 5-bromo-4-chloro-3-indolyl beta-D-glucuronide* (ISO Standard No. 16649-2:2001). International Organization for Standardization.

International Organization for Standardization. (2013). *Microbiology of the food chain - Horizontal method for the enumeration of microorganisms - Part 1: Colony count at 30 °C by the pour plate technique* (ISO Standard No. 4833-1:2013). International Organization for Standardization.

International Organization for Standardization. (2017a). *Microbiology of the food chain - Horizontal method for the detection and enumeration of Listeria monocytogenes and of Listeria spp. - Part 1: Detection method* (ISO Standard No. 11290-1:2017). International Organization for Standardization.

International Organization for Standardization. (2017b). *Microbiology of the food chain - Horizontal method for the detection, enumeration and serotyping of Salmonella - Part 1: Detection of Salmonella spp.* (ISO Standard No. 6579-1:2017). International Organization for Standardization.

Maciuc, V., Pânzaru, C., Ciocan-Alupii, M., Radu-Rusu, C.G., & Radu-Rusu, R.M. (2024). Comparative assessment of the nutritional and sanogenic features of certain cheese sorts originating in conventional dairy farms and in "mountainous" quality system farms. *Agriculture, 14*(2), 172. https://doi.org/10.3390/agriculture14020172

Pappa, E. C., Bontinis, T. G., Tasioula-Margari, M., & Samelis, J. (2022). Assessment of the microbiological quality and biochemical parameters of traditional hard Xinotyri cheese made from raw or pasteurized goat milk. *Fermentation, 8*(1), 20. https://doi.org/10.3390/fermentation8010020

Pearson, K. (1895). Notes on regression and inheritance in the case of two parents. *Proceedings of the Royal Society of London, 58*, 240–242.

Petrescu-Mag, R. M., Petrescu, D. C., Burny, P., & Azadi, H. (2017). Consumer perception of food quality in Romania: A literature review. *British Food Journal, 119*(8), 1884–1905.

Pisana, C., Caccamo, M., Barbera, M., Marino, G., Serio, G., Franciosi, E., Settanni, L., Gaglio, R., & Caggia, C. (2025). Comprehensive characterization of the microbiological and quality attributes of traditional Sicilian Canestrato Fresco cheese. *Foods, 14*(17), 3123. https://doi.org/10.3390/foods14173123

Rashtchi, P., Bazmi, A., Noshirvani, N., & Moosavy, M. H. (2021). Comparison of the microbial, physicochemical, and sensorial properties of raw and pasteurized Lighvan cheeses during ripening time. *Food Science & Nutrition, 9*, 5527–5535.

Scarlat, G., Ștefan, A. I., Cîrîc, A., Coman, S., Vasiliu, R. E., & Pogurschi, E. N. (2025). Milk's hidden treasure: Exploring whey production in cows, sheep, buffalo, and goats. *Scientific Papers. Series D. Animal Science, 68*(1), 481–488.

Stefan (Vasiliu), R. E., Ianițchi, D., Vidu, L., Răducanu, E., Nicolae, C. G., & Marin, M. (2024). Contemporary perspectives on the composition of milk fatty acids and implications for human health. *Scientific Papers. Series D. Animal Science, LXVII*(2), 181–186.

Wehr, H. M., & Frank, J. F. (Eds.). (2004). *Standard methods for the examination of dairy products* (17th ed.). American Public Health Association.

Welch, B. L. (1947). The generalization of "Student's" problem when several different population variances are involved. *Biometrika, 34*(1-2), 28–35.