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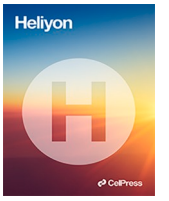

Research article

A comparative analysis of the nutritional composition of several dairy products in the Romanian market

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ABSTRACT

The aim of this study was to provide customers with additional information by analyzing and comparing the nutritional data of different dairy product varieties in Romania. Milk is an ideal source of nutrition because it contains a balanced combination of carbohydrates, proteins, fats, minerals, and vitamins. In this study, the nutritional constituents of dairy products from Romania were examined. In total, the nutritional characteristics of 143 dairy products: milk (N-42), sour cream (N-37), cheese (N-40) and butter (N-24) (energetic value, fat content, fat of which saturated fatty acids, carbohydrates, sugar, proteins, salt, calcium) were collected from the market and statistically analyzed. The average energy values of the studied dairy products were 188/261 kJ/100 ml for milk, 610/739/1091 kJ/100 g for sour cream, 2359/3022 kJ/100 g for butter and 1306 kJ/100 g for cheese. The fat concentration of the studied products was standardized. Based on the cluster analysis, some products whose characteristics differed significantly included Gordon milk (1.5%, 3.5%), Keresztúri and Szépvízi cheese.

1. Introduction

Cow's milk has a prominent place in the human diet due to its high nutritional value and easy absorption and utilization. Milk is called the perfect food, where nutritional components such as carbohydrates, proteins, fats, minerals, and vitamins are in equilibrium. In addition to its nutritional and hydration functions, milk also plays a key role in providing essential beneficial microflora, which could contribute to strengthening the immune system in all newborn mammals. At the macronutrient level, bovine milk contains the majority (85−87%) of the water. In terms of their nutritional content fats make up 3.8−5.5%, proteins 2.9−3.5% and carbohydrates 5 % [1,2]. The protein content of milk is balanced to meet the needs of humans for various amino acids [3]. At the micronutrient level,

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bovine milk also contains many bioactive compounds such as vitamins, minerals, biogenic amines, organic acids, nucleotides, oligosaccharides, and immunoglobulins [4]. Milk contains 18 of the 22 essential nutrients, including several bioactive peptides and fatty acids, caseins, whey proteins, milk polar lipids, α-linolenic acids, conjugated linoleic acids, palmitic acid (16:0), lactose and other minor components (calcium, phosphorus, magnesium and vitamin D) [1,5,6] that have important effects on human metabolism and health. The consumption of milk and dairy products has several benefits, such as a lower incidence of childhood obesity, decrease in weight loss during energy restriction in adults, decreased risk of type 2 diabetes, and a decreased risk of cardiovascular disease [7,8]. Milk has been shown to have a number of physiological functions, including anticancer, anti-inflammatory, antioxidant, antihyperglycemic, and antiosteoporosis effects [5,8]. However, individuals suffering from milk allergies or lactose intolerance should not be overlooked. Milk consumption is not recommended for these individuals [8]. Patients with lactose intolerance are advised to consume fermented dairy products [9].

Several factors affect the quality of milk, such as the breed of dairy animal, the form of feeding, the age of dairy animal, the stage of lactation and environmental factors [10,11].

To produce dairy products of constant quality, the composition of the milk to be processed was standardized. Additives such as microorganisms, coagulants, salts, vitamins, colorings, flavorings, stabilizers, and emulsifiers can be used in the production of fermented dairy products [12,13]. In the dairy industry, microorganisms play an important role in the development of a product's characteristics. Various microorganisms such as lactic acid bacteria, yeasts and molds are used in the production of fermented dairy products to impart different properties to the products [4,14].

In 2021, a total of 544 million metric tons of milk were produced worldwide [15]. Based on milk market analysis data from ClaL Italian Dairy Economic Consulting, world milk production in 2022 was 544.15 million tons, of which the EU produced 143.9×10^3 tons of milk and Romania $1{,}041 \times 10^3$ tons, 3.27 % of which were was protein and 3.81 % were fat. The processing plants in Romania produce 339×10^3 tons of drinking milk, 198 tons of acidified milk (yoghurts and other), 9.4 tons of butter and 88 tons of cheese [16].

Due to the many uses of cow's milk, consumers can choose from a wide range of high nutritional value dairy products on the market [1]. Consumers need only healthy, clean and nutritious, pathogen-free milk and milk products characterized by a low bacterial count. In different parts of the world, there are different recommendations regarding the daily consumption of milk and milk products, on average 3 servings are recommended for individuals aged 9 years and older, 2.5 servings are recommended for children aged 4–8 years, and 2 servings are recommended for children aged 2–3 years, where 1 serving represents 250 ml of milk and yogurt or 40 g of cheese [17,18].

The main purpose of the study was to analyze and compare the nutritional information of several types of dairy products available on the Romanian market to provide supplementary knowledge for the customer.

2. Materials and methods

Market research was carried out in Miercurea Ciuc during 2022 August, when all available supermarket dairy products (N-143) were collected. During the analysis 143 dairy products were used as follows: milk (N-42), sour cream (N-37), cheese (N-40) and butter (N-24). In the case of milk and butter, two different categories were applied: milk with 1.5% and 3.5% fatty content, and butter with 59–65% and 78–85% fatty content. On the other hand, for sour cream three distinct categories were defined (sour cream with 12–16%, 18–20% and 25–35% fatty content).

The following nutritional parameters were collected from the dairy product labels: energetic value, fat content, saturated fatty acid content, carbohydrate content, sugar content, protein content, salt content and calcium content. The energetic value typically refers to the amount of energy provided by a dairy product. In the context of nutrition, it represents the energy content of a given food, often measured in kilojoules (kJ). To determine the differences between the dairy product categories, descriptive statistics and box plot analysis were used. In the case of box-plot analysis quartiles (Q1, Q2, Q3, Q4) were established. The results were presented using a *Microsoft Excel 2D* bar chart.

Spearman's rank correlation was used to investigate the correlation between the nutritional parameters of dairy products using the *Ri 386 3.6.2* statistical program. Hierarchical classification was performed using the hierarchical cluster analysis method of the IBM SPSS Statistics 22 program (Ward Connection, Squared Euclidean Distance), and the results are displayed in the form of dendrograms. The detailed sample list and parameters are described in the supplementary.

Statistically significant differences between the compositions of the examined products, were tested using two-sample *t*-test. First the *f*-test was applied to determine the square of the standard deviation, after which the two-sample *t*-test was carried out. Seven parameters (energetic value, fat content, saturated fatty acids content, carbohydrate content, sugar content, protein content and salt content) were separately determined via hypothesis tests.

3. Results and discussions

3.1. Descriptive statistics

Milk is regarded as a complete diet and an excellent source of numerous nutrients. The nutritional parameters of dairy products, such as energetic value and fat, saturated fatty acid, carbohydrate, sugar, protein, salt, and calcium contents were collected and statistically analyzed. The results are presented in Table 1.

Based on the energetic value, the average 3.5% milk energetic value (261.1 kJ/100 ml) is 39% greater than the average 1.5% milk energetic value (187.9 kJ/100 ml). All studied milk samples were standardized to a 1.5% or 3.5% fat concentration. The ratios of fat to

Table 1
Descriptive statistics of the studied milk (3.5 % and 1.5 %) nutritional parameters*kJ/100 ml, g/100 ml.

		Ener.v. kJ/100 ml	Fat, g/100 ml	Sat. f.a., g/100 ml	Carbohy., g/100 ml	Sugar, g/100 ml	Prot., g/100 ml	Salt, g/100 ml	Ca^{2+}., g/100 ml
Milk 3.5%	**min**	253	3.5	2	3.9	2.75	2.9	0.04	118
	Average	***261.1***	***3.5***	***2.3***	***4.5***	***4.5***	***3.1***	***0.1***	***120.7***
	Max	273	3.8	2.8	4.7	4.7	3.39	0.13	125
	Count	31	31	29	31	31	31	30	12
	Stdev.	6.3	0.1	0.2	0.2	0.3	0.1	0.0	3.3
	CI - 95	258.8	3.5	2.2	4.4	4.3	3.1	0.1	118.6
	CI + 95	263.4	3.6	2.4	4.6	4.6	3.2	0.1	122.8
Milk 1.5%	**min**	167	1.5	0.8	4.12	2.6	3	0.04	118
	Average	***187.9***	***1.6***	***1.0***	***4.5***	***4.5***	***3.2***	***0.1***	***121.5***
	Max	235	2.8	1.9	4.9	4.9	3.4	0.14	125
	Count	28	28	25	28	28	28	27	10
	Stdev.	11.19	0.25	0.19	0.16	0.39	0.11	0.03	3.69
	CI - 95	183.5	1.5	0.9	4.5	4.3	3.1	0.1	118.9
	CI + 95	192.2	1.7	1.1	4.6	4.6	3.2	0.1	124.1

Where: *Ener.v.- Energic value*, *Fat* - fat content, *Sat. f.a.* - Fat content of which saturated fatty acids, *Carbohy.* - carbohydrates, *Prot.* -Proteins, Ca^{2+}.- Calcium.

Table 2
Descriptive statistics of the studied sour cream parameters, *kJ/100 g, g/100 g.

		Ener.v.* kJ/100 g	Fat, g/100 g	Sat.f.a., g/100 g	Carbohy., g/100 g	Sugar, g/100 g	Prot., g/100 g	Salt, g/100 g
1. Sour cream 10–16%	min	536	12	7	2.8	2.14	1.9	0
	Average	***610.06***	***13.53***	***8.31***	***3.33***	***3.14***	***2.88***	***0.11***
	Max	685	16	9.93	4.1	4.1	3.96	0.32
	Count	18	19	18	19	19	19	19
	Stdev	59.146	1.679	0.93	0.396	0.518	0.417	0.083
	CI-95	580.77	12.72	7.84	3.14	2.89	2.68	0.07
	CI + 95	639.34	14.34	8.77	3.52	3.39	3.08	0.15
2. Sour cream 20–25%	min	750	18	12	2.2	2.2	1.2	0.04
	Average	***738.81***	***19.56***	***12.64***	***3.21***	***3.17***	***2.41***	***0.11***
	Max	840	20	14.6	4.6	4.6	2.9	0.2
	Count	9	9	8	9	9	9	9
	Stdev	35.88	0.88	0.9	0.68	0.69	0.55	0.04
	CI-95	785	18.88	11.89	2.68	2.65	1.99	0.08
	CI + 95	840	20.23	13.35	3.73	3.70	2.83	0.15
3. Sour cream 25–35%	min	986	25	14	1.58	1.1	1.7	0.04
	Average	***1091.8***	***27.3***	***17.2***	***2.7***	***2.5***	***2.3***	***0.1***
	Max	1372	35	23	4.1	4.1	3.2	0.1
	Count	12	12	12	12	12	12	12
	Stdev	130.953	3.545	2.930	0.804	0.911	0.440	0.023
	CI-95	1008.55	25.00	15.35	2.19	1.91	2.06	0.07
	CI + 95	1174.95	29.50	19.08	3.21	3.07	2.62	0.10

Where: *Ener.v.- Energic value*, *Fat*-fat content, *Sat. f.a.* - Fat content of which saturated fatty acids, *Carbohy.* - carbohydrates, *Prot.* - Proteins.

Table 3
Descriptive statistics of the studied butter and cheese parameters, *kJ/100 g, g/100 g.

		Ener.v., kJ/100 g	Fat, g/100 g	Sat. f.a., g/100 g	Carbohy., g/100 g	Carbohy., g/100 g	Prot. g/100 g	Salt, g/100 g
Butter 40–65%	min	2232	59	24	0.2	0.2	0.2	0
	Average	***2358.94***	***63.38***	***36.69***	***0.50***	***0.51***	***0.71***	***0.39***
	Max	2527	65	55	1.7	1.6	1.5	2
	Count	16	16	15	16	12	16	16
	Stdev	97.83	2.50	7.49	0.33	0.36	0.38	0.67
	CI-95	2306.81	62.04	32.54	0.32	0.28	0.51	0.03
	CI + 95	2411.07	64.71	40.84	0.67	0.74	0.91	0.75
Butter 78–82%	min	2905	78	35	0.1	0.1	0.1	0
	Average	***3021.67***	***80.95***	***47.64***	***0.40***	***0.29***	***0.59***	***0.19***
	Max	3092	82	53	1	0.6	1	1.2
	Count	21	21	17	21	16	21	21
	Stdev	54.16	1.47	5.87	0.24	0.19	0.28	0.35
	CI-95	2997.01	80.29	44.62	0.29	0.19	0.47	0.03
	CI + 95	3046.32	81.62	50.66	0.51	0.39	0.72	0.35
Cheese	min	981	15.49	10.06	0.19	0.03	18	0.65
	Average	***1305.98***	***23.54***	***14.47***	***1.37***	***0.57***	***24.30***	***1.74***
	Max	1646	34.1	24.1	3.48	1	30.04	3
	Count	46	47	47	47	47	47	47
	Stdev	153.71	4.13	3.16	1.06	0.34	2.76	0.48
	CI-95	1267.90	22.53	13.69	1.11	0.49	23.62	1.62
	CI + 95	1344.05	24.55	15.24	1.63	0.66	24.98	1.86

Where: *Ener.v.- Energic value*, *Fat*-fat content, *Sat. f.a.* - Fat content of which saturated fatty acids, *Carbohy.* - carbohydrates, *Prot.* - Proteins.

saturated fatty acid were quite similar in the 2 types of milk, varying between 0.62 and 0.65. In milk only lactose is present, so the carbohydrate and sugar contents are equal to 4.5 g/100 ml in all types of milk. Similar to the lactose concentration the protein, salt and calcium concentrations were equal or quite similar between the two types of milk.

Table 2 presents the macro nutritional characteristics of the three types of sour cream. The classification was also made based on the fat content, but in these cases not only the nominal fat concentration fixed but also an interval was used. The light sour cream was covered with 10–16 %fat, semi light with 20–25 % fat, and high with 25-35 % fat contenet. Compared to the energetic value on average the fat sour cream contained 78.85% more energy (1091 kJ/100 g) than the light cream (610 kJ/100 g). On average, the fat contents of the three sour cream types were 8.31 g/100 g, 12.64 g/100 g and 27,3 g/100 g. In the case of fattier sour cream, fat is present in a larger proportion of the total volume; therefore, the proportions of the non-fat-based phase will be less than those of carbohydrates and proteins.

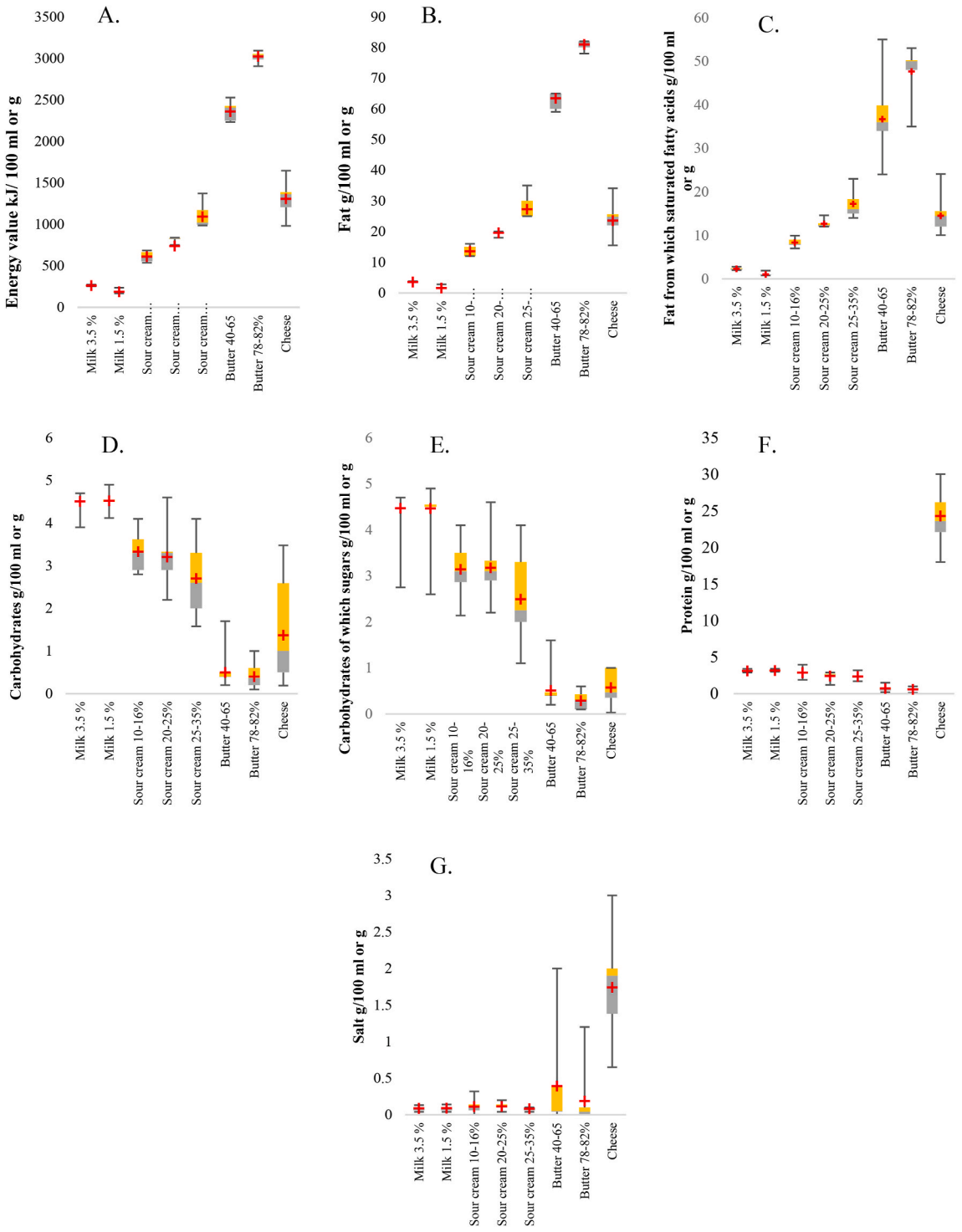

Fig. 1. Box plot analysis of studied dairy products: A-Energy value, B-Fat, C-Fat from which saturated fatty acids, D-Carbohydrates, E-Carbohydrates of which sugars, F-Protein, G-Salt.

Focusing on the nutritional values of the studied butter and cheese dairy products, it is evident that the butter is rich in fat and that the cheese is rich in protein and fat. The average light energy of the butter was 2359 kJ/100 g, while that of the butter with a higher fat concentration was 3022 kJ/100 g. Similarly, the average energy content of cheese was 1306 kJ/100 g. Butter is mostly composed of fat; the average fat content of the two examined butter categories was 63.38 and 80.95 % fat, hence because of the high fat content,

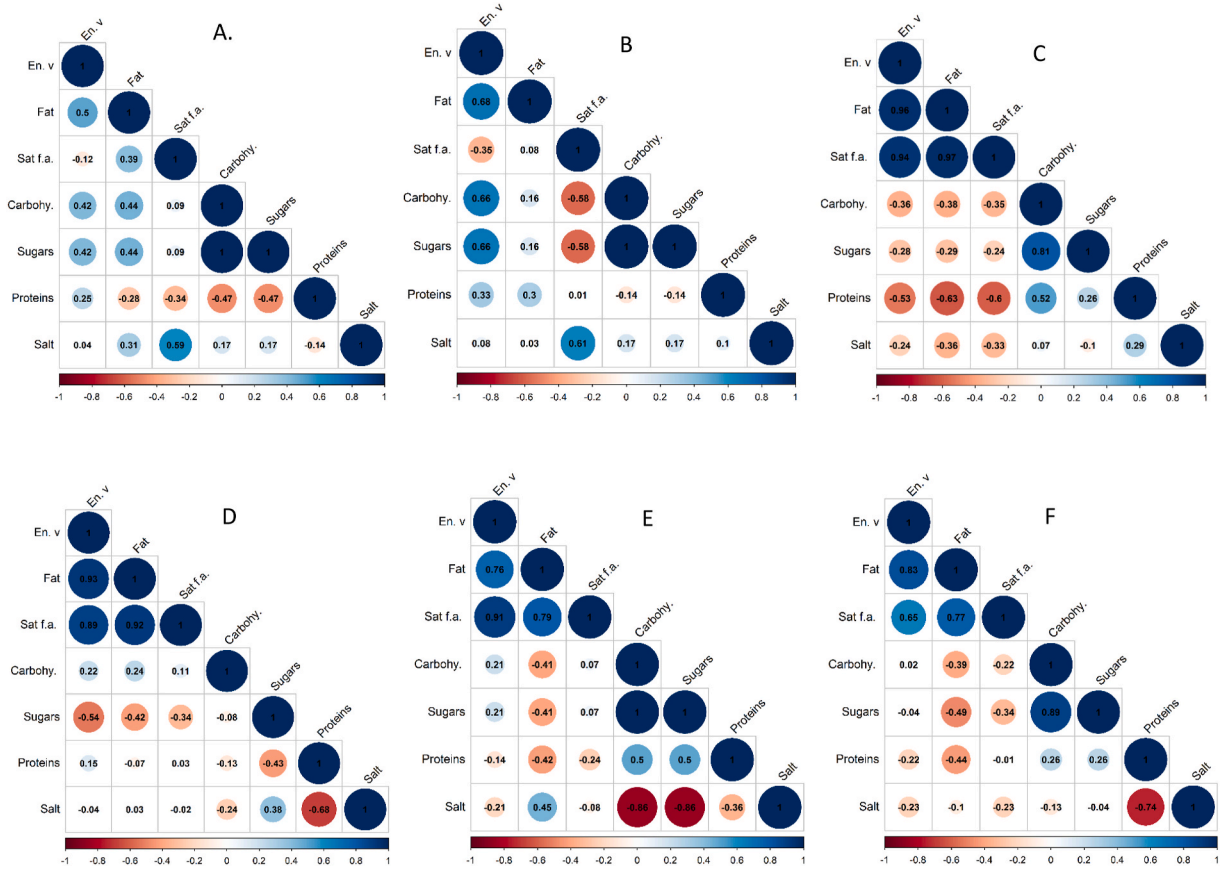

Fig. 2. Spearman correlation coefficient matrix: A - milk 1.5%, B - milk 3.5%, C - sour cream, D - cheese, E – butter 40–65%, F - butter 78–82%.

butter is a concentrated source of energy, but it contains little protein and no carbohydrates [19]. Cheese has high protein (24.3 g/100 g) and fat (23.54 g/100 g) contents, which is why it plays a very important role in nutrition (Table 3). Regarding salt content of cheese, during the technological process the salt content (1.74 g/100 g) of the cheese was adjusted by the addition of salt.

3.2. Box plot analysis

To present the nutritional differences a box plot analysis was carried out. During digestion, 1 g of fat has 2.25 times higher energies than 1 g of protein or 1 g of carbohydrate, and therefore based on the energy, fat content and saturated fatty acid content, the studied dairy products decrease in the following order: butter 78–82% > butter 40–65%> cheese > sour cream 25–35%> sour cream 20–25%> sour cream 10–16%> milk 3.5%> milk 1.5%. The carbohydrate content coincided with the sugar content because only lactose was present. The protein content of the cheese was 24.3 g/100 g, that of butter varied between 0.6 and 0.7 g/100 g, and that of the sour cream and the milk varied between 2.3 and 2.8 g/100 g and 3.1–3.2 g/100 l, respectively. The original salt content of milk and sour cream was 0.1 g/100 ml. For butter (0.2–0.4 g/100 g) and cheese (1.74 g/100 g), the final salt content is obtained by adding salt during the technological process (Fig. 1).

3.3. Spearman correlation analysis

Spearman correlation analysis revealed significant correlations based on the sample size at p-0.05 level. In the case of 1.5% and 3.5% milk, the significance levels were N = 20, r = ±0.38 and N = 22 , r = ±0.36, respectively (Fig. 2A-B).

The most significant positive correlations, r = 0.59 and r = 0.61, were detected between the salt and saturated fatty acid contents, respectively. Additionally, a strong positive correlation was found between the sugar and energy contents (r = 0.42 and r = 0.66, respectively). In the case of carbohydrate and sugar correlation, the r = 1 correlation coefficient indicates that lactose is the only type of sugar present in the milk products. A negative correlation between the protein content and the sugar content (r = −0.43) was detected for the 1.5% milk, and a negative correlation between the sugar content and the saturated fatty acid content (r = −0.58) was detected for the 3.5% milk.

For 10–16%, 18–20% and 25–35% sour cream, the significance level used was r = ±0.335 for N = 34, (Fig. 2C). A linear correlation between fat content and the energetic value was detected, and a positive correlation was detected (r = 0.96). A significant negative

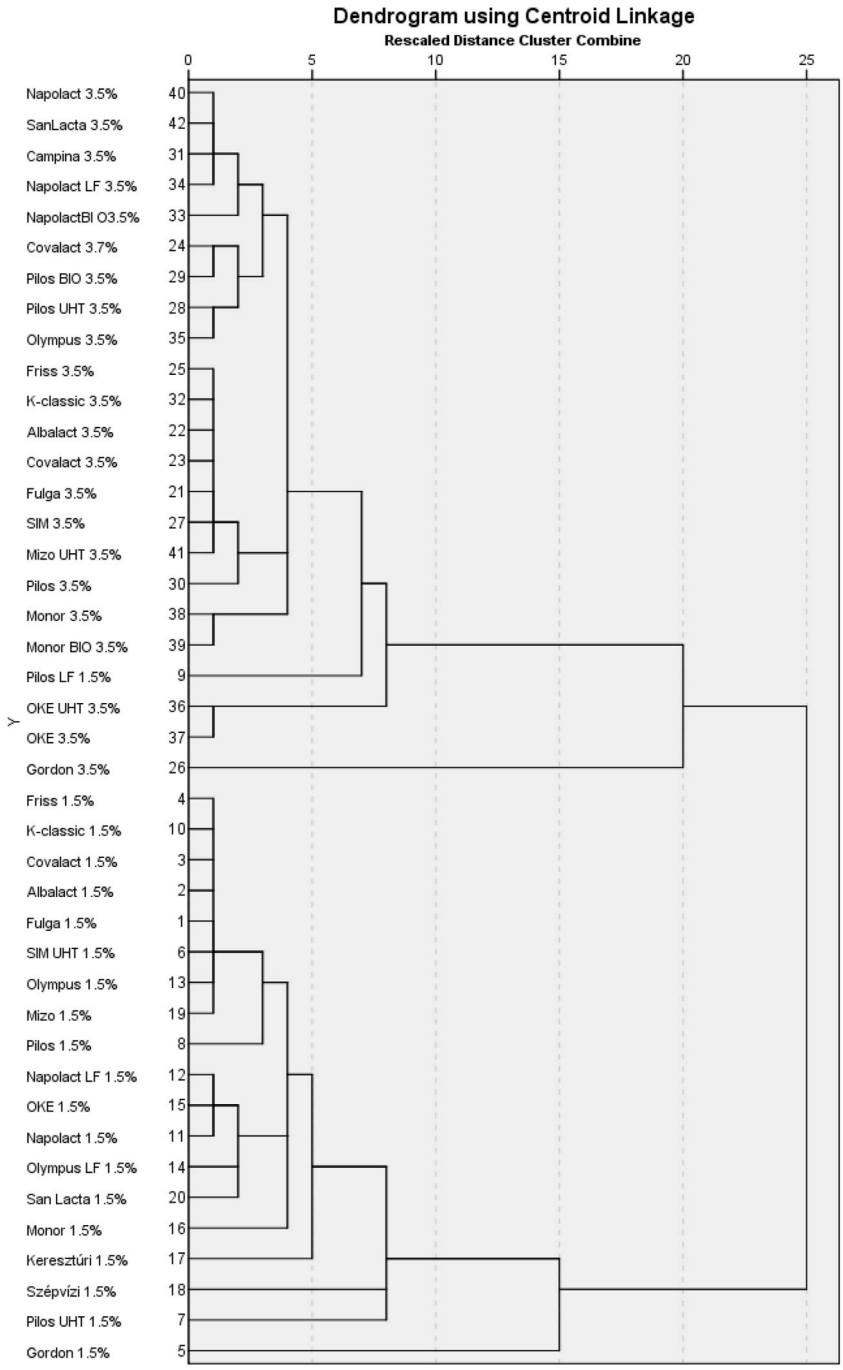

Fig. 3. Dendrogram of the studied milks.

correlation was found between protein-energy ($r = -0.53$) and protein-fat ($r = -0.63$) contents and a significant negative correlation was detected between carbohydrate and energy ($r = -0.36$) and between carbohydrate and fat ($r = -0.38$) contents (Fig. 2C).

In the case of cheese, a significance level of $N = 40$, $r = \pm 0.313$ was used. A very strong positive correlation was found between fat: saturated fatty acid content ($r = 0.92$) and fat: energetic value ($r = 0.93$). A strong negative correlation was observed between the sugar: energy ($r = -0.54$) and fat: sugar content ($r = -0.42$). Furthermore, a strong negative correlation was identified between salt and protein content ($r = -0.68$) (Fig. 2D). The significance level for butter's Spearman correlation analysis was $r = \pm 0.587$ for ($N = 12$).

A highly significant positive correlation was found between the fat content and the energy content: $r = 0.76$, and $r = 0.83$, respectively. On the other hand, a strong negative correlation was detected between salt: carbohydrate ($r = -0.86$) and salt: protein (r

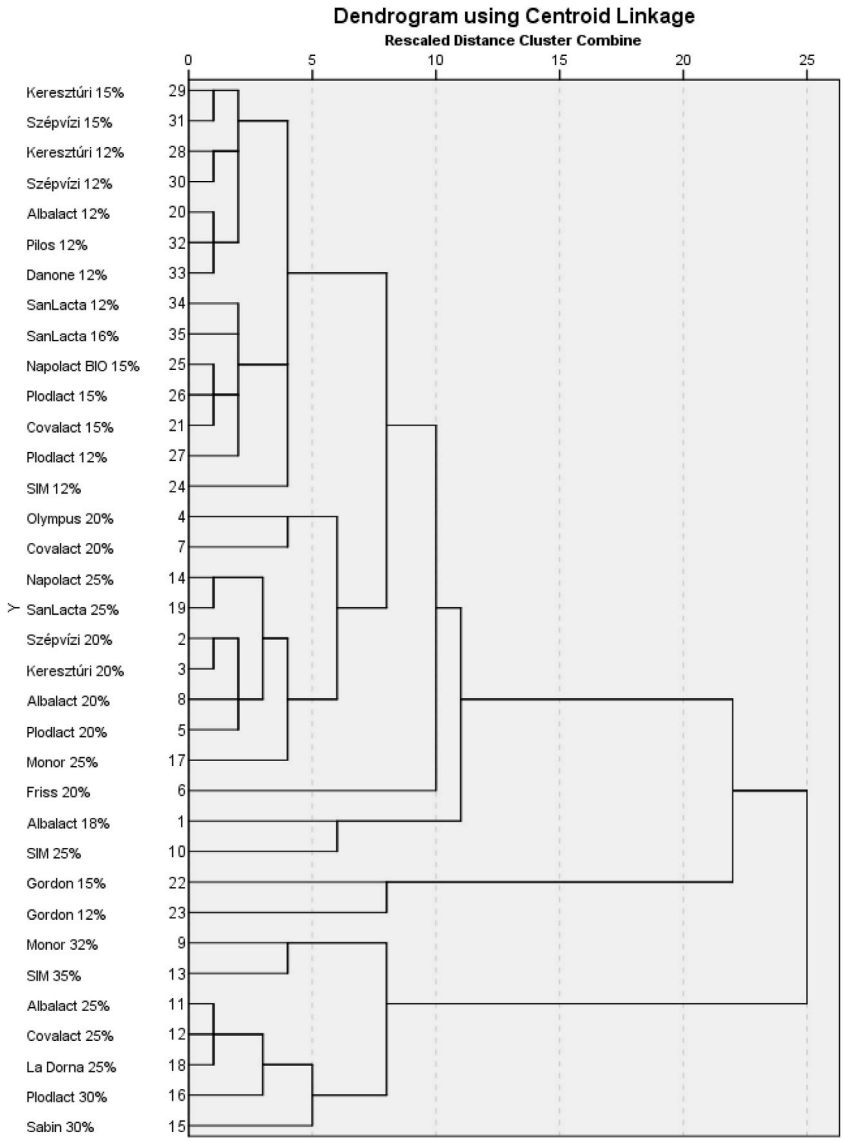

Fig. 4. Dendrogram of the studied sour creams.

= −0.74) (Fig. 2E-F).

Depending on the specific variables analyzed, these correlations might inform consumers about potential relationships between various components within dairy products. For example, a positive correlation between fat content and energy content could help consumers make informed choices based on their dietary needs. Further analysis with larger sample sizes and considering different fat content ranges within product categories could provide even more practical insights.

3.4. Hierarchical cluster analysis

Clustering was used to identify differences within groups. Among the types of milk brands, Gordon milk (1.5%, 3.5%) differed from other types of milk. There were significant differences in the sugar content, with 70% of the carbohydrate content being sugar. In the case of other types of milk, all carbohydrates were lactose (Fig. 3).

According to the three studied types of sour cream, cluster 1 contained the majority of the products (N-28), whereas cluster 2 contained 7 products (Fig. 4).

In the case of the studied butters, three different clusters were observed (Fig. 5). The Olympus and Lurpak brands are characterized by lower saturated fatty acid contents than other types of butter (37–43 g/100 g compared to 50–53 g/100 g). Olympus 65% butter is in cluster 2 because it has a sugar content of 1.6 g/100 g, which is three times higher compared to other brands. Cluster 1 is composed of two subclusters. Subcluster 1.1 contains butter with more than 80% fat content, and in subcluster 1.2 are butter with 60–65% fat

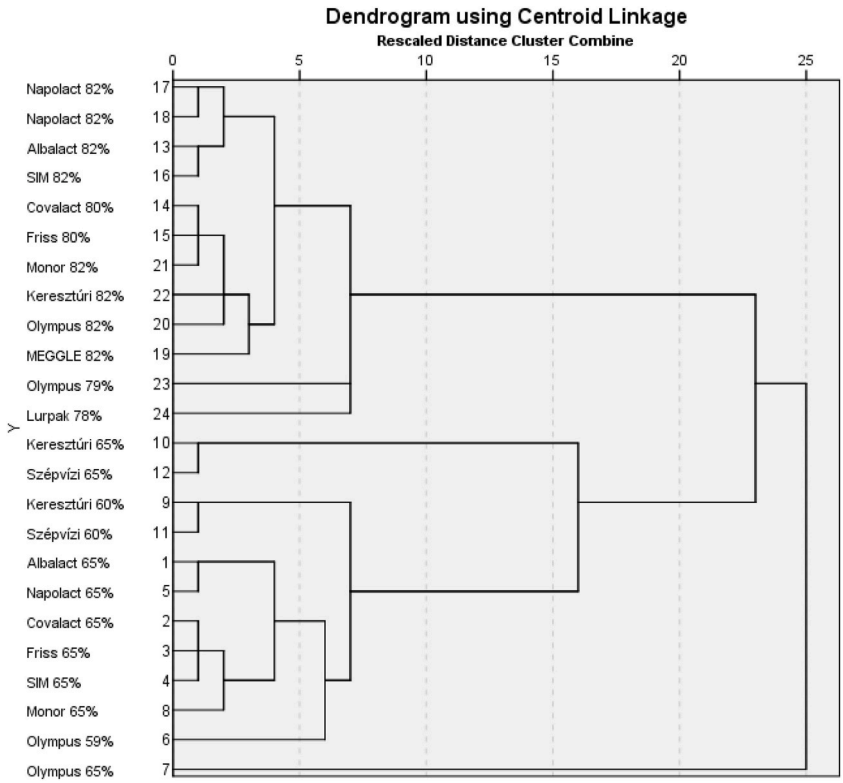

Fig. 5. Dendrogram of the studied butters.

content.

Regarding the results of cluster analysis in case of cheeses the majority of the studied cheeses were in cluster 1 (Fig. 6). Clusters 2 and 3 were represented by *Keresztúri* and the *Szépvízi* brand, where higher protein content (28 g/100 g) was reported than in the cheeses in cluster 1 (23 g/100 g).

The cluster analysis also shows that products within the same product categories can be divided into different clusters, which draws attention to the diversity and differences within the group, which was also the goal of our research.

3.5. Hypothesis tests

In total 196 *f*-tests and 196 *t*-tests were carried out to determine the differences between the studied dairy products. According to our observations, significant differences were observed in all cases regarding the energy, fat, and fatty acid contents. The summary results are presented in Table 4. For the sample sets tested, 84.69% of the differences were found. There was no difference in the remaining 15.31%. There were no significant differences in carbohydrate content between the two types of milk, the three different types of sour cream and the two types of butter. The sugar content was similar between milk (1.5%–3.5%) and cream, butter and cheese. Except for milk, the protein content of all dairy products differed significantly. Most of the dairy products had similar salt contents, with the only exception being cheese. The detailed hypothesis test results are presented in Table 4. The results of the hypothesis tests indicate that the seven different nutritional parameters of cheeses differ from the nutritional values of all the tested products, except for butter 40–65%, where six nutritional parameters differed, while the sugar content was similar. Regarding butter and other dairy parameters, only the salt content was similar, while other parameters differed. For milks, the energy, fat, and fatty acid content differed, while the remaining nutritional parameters were similar.

The main reason for the standardization of milk at 1.5% or 3.5% in the dairy sector is to maintain consistency, nutritional accuracy, production efficiency, regulatory compliance, and consumer satisfaction [20]. The main carbohydrate in milk is lactose, which enhances its nutritional balance by providing energy as sugars and aiding in the absorption of essential elements such as calcium. This synergistic effect between lactose and other milk components makes milk a vital food [21]. As a result, lactose indirectly affects the protein-to-carbohydrate ratio in milk, thereby influencing its nutritional value [22].

Dairy products' calorie is impacted by variations in fat content. Full-fat dairy products include more calories; therefore, they can be better suited for people who want to maintain or gain weight. On the other hand, people who are trying to control their weight or reduce their calorie intake tend to favor low-fat or fat-free dairy products [23]. Dairy products contain a mix of saturated, monounsaturated, and polyunsaturated fats. The type and amount of fatty acids present influence cardiovascular health. For instance, excessive intake of saturated fats, commonly found in high-fat dairy products such as butter and cheese, may increase LDL cholesterol

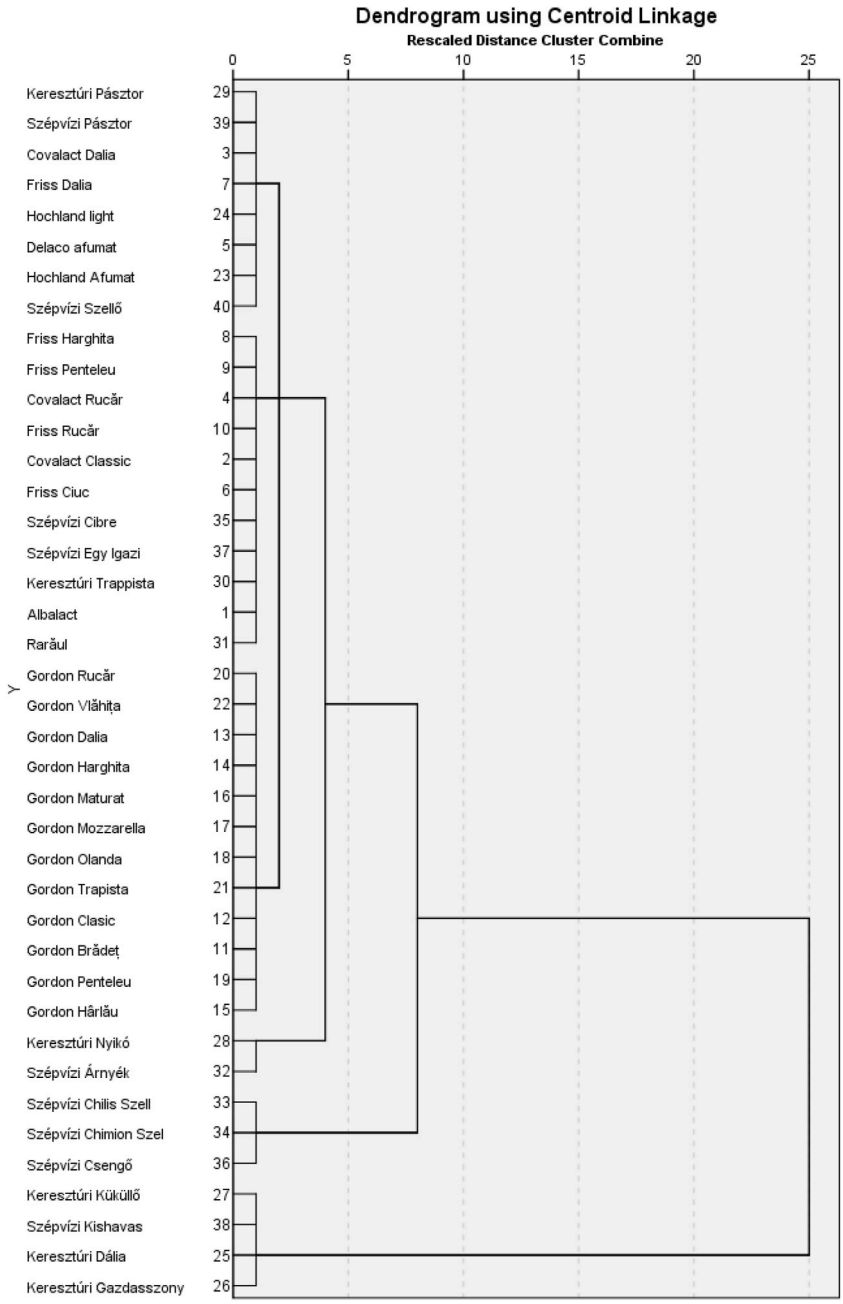

Fig. 6. Dendrogram of the studied cheeses.

levels and the risk of heart disease [24]. Dairy products are rich sources of high-quality protein and contain essential amino acids necessary for various physiological functions, including muscle repair and growth [25]. Cheeses may contain added salt for flavor enhancement and preservation. Excessive salt intake is associated with hypertension and cardiovascular disease, so monitoring the salt content in dairy products is important for individuals following a low-sodium diet [26].

4. Conclusion

In this research, the following parameters of dairy products, milk, sour cream, cheese and butter, were statistically examined to determine the differences and similarities between the product categories. A significant positive correlation was found between fat and energetic value in all products. Additionally, a significant negative correlation was found between fat and protein content in the butters. In the case of cheese, the protein and fatty acid contents are closely related. According to the cluster analysis, the protein

Table 4
Hypothesis test results.

		Milk 3.5 %	Sour cream 10-16%	Sour cream 20-25%	Sour cream 25-35%	Butter 40-65%	Butter 78-82%	Cheese
Milk 1.5 %	Energy	1	1	1	1	1	1	1
	Fat	1	1	1	1	1	1	1
	Fatty acid	1	1	1	1	1	1	1
	Carbohydrate		1	1	1	1	1	1
	Sugare		1	1	1	1	1	1
	Protein		1	1	1	1	1	1
	Salt							1
Milk 3.5 %	Energy		1	1	1	1	1	1
	Fat		1	1	1	1	1	1
	Fatty acid		1	1	1	1	1	1
	Carbohydrate		1	1	1	1	1	1
	Sugare		1	1	1	1	1	1
	Protein		1	1	1	1	1	1
	Salt			1				1
Sour cream 10-16%	Energy			1	1	1	1	1
	Fat			1	1	1	1	1
	Fatty acid			1	1	1	1	1
	Carbohydrate				1	1	1	1
	Sugare				1	1	1	1
	Protein			1	1	1	1	1
	Salt							1
Sour cream 20-25%	Energy				1	1	1	1
	Fat				1	1	1	1
	Fatty acid				1	1	1	1
	Carbohydrate					1	1	1
	Sugare					1	1	1
	Protein				1	1	1	1
	Salt							1

		Milk 3.5 %	Sour cream 10-16%	Sour cream 20-25%	Sour cream 25-35%	Butter 40-65%	Butter 78-82%	Cheese
Sour cream 25-35%	Energy					1	1	1
	Fat					1	1	1
	Fatty acid					1	1	1
	Carbohydrate					1	1	1
	Sugare					1	1	1
	Protein					1	1	1
	Salt							1
Butter 40-65%	Energy						1	1
	Fat						1	1
	Fatty acid						1	1
	Carbohydrate							1
	Sugare							
	Protein						1	1
	Salt							1
Butter 78-82%	Energy							1
	Fat							1
	Fatty acid							1
	Carbohydrate							1
	Sugare							1
	Protein							1
	Salt							1

content of some cheese brands, namely, *Keresztúri* and *Szépvízi* Brands, was significantly greater. The Gordon milk (1.5%, 3.5%) contains a significantly higher lactose content than the other types of milk. During the fermentation process, carbohydrates are partially consumed, thus the carbohydrate content of the manufactured product is lower than that of the original milk. A comparison of the parameters of the seven different products revealed that the majority of the studied dairy product nutritional components (85%) showed significant differences. The nutritional differences of the studied dairy products could provide further useful information for consumer to plan more suitable nutritional plans.

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Limitation

Not applicable.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

CRediT authorship contribution statement

Katalin Bodor: Writing – original draft, Validation, Resources, Methodology, Investigation, Formal analysis, Conceptualization. **Borbála Tamási:** Methodology, Validation, Formal analysis. **Ágnes Keresztesi:** Validation, Methodology. **Zsolt Bodor:** Validation, Methodology, Investigation, Conceptualization. **Kálmán Csongor Orbán:** Writing – review & editing. **Róbert Szép:** Visualization, Supervision, Software, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e31513.

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