

Nutrition analysis – with particular focus on carbohydrate content in kefir and natural yoghurts in the Polish consumer market

Analiza wartości odżywczej – w szczególności zawartości węglowodanów w kefirach oraz jogurtach naturalnych i smakowych na polskim rynku konsumenta

¹Irena Mańkiewicz-Żurawska*, ¹Wanda Lutogniewska*, ²Eliza Skała-Zamorowska,
²Przemysław Jarosz-Chobot

¹Department of Children's Diabetology and Paediatrics, Upper Silesian Children's Health Centre, Katowice, Poland

²Department of Children's Diabetology, Medical University of Silesia, Katowice, Poland

*Contributed equally as first authors.

Abstract

The aim of the study was to assess the nutrition of selected fermented dairy products available in Polish supermarkets and how many of them meet the criterion set by the European Parliament and Council Act (UE) no. 1924/2006 form 20 December 2006 on nutrition and health claims made on foods regarding low sugar content in a solid product. In the study 100 fermented products, widely available in Polish supermarkets, were selected, and their nutrition was analysed based on the information placed on the producer's label, and the carbohydrate content was compared against the recommended 5 g per 100 g of the solid product.

As a result, it was determined that among natural products, 92% of the kefir and 36% fulfilled the carbohydrate content criterion, whereas out of the analysed flavoured products, only one.

Key words: dairy fermented produce, kefir, yoghurt, nutritional value, energy value, carbohydrates, protein, fats.

Introduction

According to the World Health Organisation's definition, fermented milk products are a group of products made out of milk (full milk, semi or fully skimmed, powdered milk), which have been fermented by particular microorganisms. In a balanced diet dairy fermented produce, such as soured milk, kefir, and the new generation of milk products are recommended [1]. This group is a source of probiotics, and many vitamins and minerals necessary for normal body function [2]. The products included in this group have prophylactic properties in the therapy of many diet-related diseases. They have a beneficial influence on microbiota by suppressing growth of pathogenic and putrid bacteria [3]. Fermented dairy produce increase fat, protein, and vitamin absorption. Moreover, they are safer for those afflicted by allergies in comparison with milk because they evoke less pronounced allergic reaction [4].

The most frequently fermented products chosen by the clients were kefir and yoghurts [5]. They contain live bacteria cultures. The natural ones have different contents in comparison

to the flavoured products. The flavoured fermented products are chosen for their sensory values. The producers offer various and more sophisticated flavours. Adding them enhances their taste and affects the quality and energy value of the products [6]. According to the Polish National Institute of Public Health – National Institute of Hygiene, the nutritional information label shows the amounts of nutrients: energy, fats, carbohydrates, proteins, and salt, which are contained in the product. Placing the information about nutrition value on food consistent with European Parliament and Council directive no. 1924/2006 enables customers to make an informed choice about the product [7].

According to WHO data, since the 1970s there has been a threefold increase in the obesity rate worldwide [8]. It is believed that the main causes are a decrease in physical activity and increased consumption of simple carbohydrates. It is the result of using saccharose and other additional sweeteners in the production of popular food products [9]. With this in mind, the nutritional value and carbohydrate content in particular are among the overriding indicators of good quality of a dairy product [10].

The aim of the study was to assess the nutrition value – carbohydrates in particular – of natural and flavoured kefir and yoghurts available in Poland.

Material and methods

The study included over 100 randomly chosen, widely available kefir and yoghurts between May and June 2020. Particular products were selected from chain supermarkets: Biedronka, Tesco, and Lidl. The products were divided into 4 groups: 1) natural kefir (25 products), 2) flavoured kefir (25 products), 3) natural yoghurt (25 products), and 4) flavoured yoghurt (25 products). Based on the information on the label, their nutrition was evaluated, with particular focus on carbohydrate content and energy value. Next, the mean nutrition for each group was calculated, and all the groups were compared. While selecting the products for the study, the main criterion was variety of dairy products manufacturers.

The obtained results were analysed with Student's *t*-test, analysis of variance (ANOVA), and Tukey's range tests. $P < 0.05$ was determined as statistically significant.

Results

In the group of natural kefir the mean energy value in 100 g was 46.10 ± 5.98 kcal (32.50–51.00 kcal). The mean carbohydrate content for 100 g of the natural kefir was 4.67 ± 0.66 g (3.40–6.70 g). The mean fat content in 100 g of natural kefir was 1.64 ± 0.64 g (0.00–3.00 g), and protein 3.14 ± 0.68 g (0.50–4.00 g) in 100 g of the product. The nutrition of selected natural kefir is presented in Table I.

In the group of flavoured kefir the mean energy value for 100 g of the product was 74.84 ± 28.50 kcal (36.00–144.00 kcal). The mean carbohydrate content for 100 g of the flavoured kefir was 11.31 ± 3.74 g (3.40–22.00 g). The mean fat content in 100 g was 2.04 ± 2.24 g (0.05–7.50 g), and protein was 3.36 ± 1.43 g (1.30–8.00 g). Table II presents the nutritional value of selected flavoured kefir.

The comparison of mean nutrition between both groups of kefir is presented in Table III.

The energy value and the carbohydrate content was significantly lower in the natural kefir than in the flavoured ones. There was no statistically significant difference determined in fat or protein content between natural and flavoured kefir.

In natural yoghurt the mean energy value for 100 g of the produce was 71.60 ± 25 kcal (38.00–125.00 kcal). On the other hand, in the group of natural yoghurt, the mean carbohydrate content for 100 g of the product was 5.45 ± 0.85 g (4.10–7.60 g), the average fat content in 100 g of the product was 4.00 ± 3.04 g (1.00–10.00 g), and protein was 4.42 ± 1.05 g (3.30–8.70 g). The nutrition of selected natural yoghurt is presented in Table IV.

In the analysed flavoured yoghurt the mean energy for 100 g of the product was 108.92 ± 28.12 kcal (71.00–168.00 kcal). The mean carbohydrate content for 100 g of the flavoured yoghurt was 15.25 ± 2.61 (11.10–21.50) g, the fat content was

3.73 ± 2.47 g (1.30–10.10 g), and protein 3.21 ± 1.17 g (3.20–7.00 g). Table V shows the energy value of the chosen flavoured yoghurt.

Table VI shows the comparison of the energy value between the 2 groups of yoghurt.

The energy value and carbohydrate content was significantly lower in natural than in flavoured yoghurt. There was no significant difference in fat content between natural and flavoured yoghurt.

The lowest mean energy value was determined in the group of natural kefir (46.10 kcal/100 g). Natural yoghurt and flavoured kefir had similar energy value: 71.60 kcal/100 g (34.08 kcal more than natural kefir) and 74.84 kcal/100 g (37.32 kcal more than natural kefir), respectively. Flavoured yoghurt had the highest energy value (108.92 kcal/100 g) – 62.82 kcal more than natural kefir.

Natural kefir had the least carbohydrates (4.67 g/100 g). The natural yoghurt had only slightly higher content of the carbohydrates (5.45 g/100 g). Flavoured kefir had 6.64 g more carbohydrates than natural kefir and 5.86 g more than natural yoghurt. Flavoured yoghurt had the most carbohydrates – 10.58 g more than natural kefir, 9.80 g more than natural yoghurt, and 3.94 g more than flavoured kefir.

The comparison of the energy value between the studied groups of the dairy fermented products is presented in Table VII.

ANOVA analysis and Tukey's test revealed that natural kefir had the lowest energy value and carbohydrate contents out of the 4 groups of studied fermented milk products, and the difference was statistically significant.

Discussion

This study assessed the nutritional value of kefir and yoghurt widely available for purchase in Polish supermarkets. According to the European Parliament and Council Act (UE) no. 1924/2006 from 20 December 2006 on nutrition and health claims made on foods [7], an appropriate/low sugar content in a solid product can be claimed if it contains no more than 5 g of sugar per 100 g. The term carbohydrate is used by the authors in respect to all types of carbohydrates contained in the studied milk products, both naturally occurring and added sugars.

In the conducted study Polish flavoured kefir and yoghurt on average contained, respectively, 11.31 g and 15.24 g of carbohydrates per 100 g of the product. Therefore, it can be said that flavoured kefir available on the Polish market contain twice and flavoured yoghurt contain three times the recommended amount of sugar. However, the natural kefir and yoghurt contain, respectively 4.67 g and 5.45 g per 100 g of the product; therefore, they are composed from considerably lower amounts of carbohydrate in comparison to their flavoured counterparts. It should be noted that in both groups (natural kefir and yoghurt) there are products that do not fulfil the criterion regarding maximum carbohydrate content. Within the studied group of natural kefir, 8% exceeded the recommended maximum carbohydrate content, and within the natural yoghurt – as much as 64% did not meet this recommendation.

There were no significant changes reported in the results of this study compared to the results obtained by Wierzejska 5 years prior, in which sugar content in flavoured kefir and yoghurts available on the Polish market was determined as 11 g and 13 g, respectively, per 100 g, whereas in natural kefir and

yoghurts the amounts were 4.4 g and 5.4 g per 100 g [11]. In other countries: Australia, Great Britain, and the Republic of South Africa, the observations of Coyle in 2019 indicated considerably lower sugar contents in flavoured yoghurts and milks (respectively, 11.9, 12.4, and 10.1 g) [12].

Table I. The nutrition (energy value, carbohydrates, fats, proteins) in natural kefir – information on the food labels from the lowest to the highest carbohydrate content

No.	Brand	Name of the kefir	The nutrition value in a 100 g			
			Energy (kcal)	Carbohydrates (g)	Fats (g)	Proteins (g)
1	Ayran	Kefir	36.00	3.40	1.50	2.20
2	Bakoma	Kefir 0.5%	32.50	4.00	3.00	0.50
3	Danone	Kefir 1.5%	49.00	4.00	1.50	2.90
4	Polana	Kefir 2%	45.00	4.00	2.00	2.70
5	Mild	Kefir bio mild 1.5%	44.00	4.10	1.00	3.40
6	Robico	Kefir	43.00	4.20	1.50	3.10
7	Piątnica	Kefir 2%	52.00	4.20	2.00	4.00
8	OZO	Kefir	43.00	4.50	1.50	3.20
9	Tola	Kefir dense 1.5%	44.00	4.50	1.50	3.20
10	Mleczna dolina	Kefir 1.5%	44.00	4.50	1.50	3.20
11	Pszczyna	Kefir natural 1.5%	46.00	4.60	1.50	3.40
12	Activia	Kefir	57.00	4.70	3.00	2.80
13	Pilos	Kefir	46.00	4.70	1.50	3.30
14	Pilos	Kefir velvety 2%	50.00	4.70	2.00	3.20
15	Pilos	Kefir natural 2%	50.00	4.70	2.00	3.20
16	Łowicz	Kefir 1.5%	46.00	4.70	1.50	3.30
17	Opole	Kefir traditional 1.5%	45.00	4.70	1.50	3.10
18	Piątnica	Kefir 0%	35.00	4.80	0.00	3.00
19	Tola	Kefir 2%	51.00	4.80	2.00	3.40
20	Mlekpól	Kefir	51.00	5.00	1.80	3.60
21	Just fi	Kefir just fit	37.00	5.00	0.10	3.90
22	Pilos	Kefir creamy 2%	50.00	5.00	2.00	4.00
23	Bieluch	Kefir tola 2%	51.00	5.00	2.00	3.30
24	Radomsko	Kefir ale 1.5%	54.00	6.20	1.50	3.80
25	Auchan	Kefir 1.5%	51.00	6.70	1.50	2.70
MEAN			46.10	4.67	1.64	3.14

Analysis conducted by Azais-Braesco in 10 European countries indicate that 15–21% of energy requirements in adults and 16–26% in children are covered by simple carbohydrates. According to this analysis, the main source of simple carbohydrates are sweets (36 to 61% in adults and 40 to 50%

in children), beverages (12 to 31% in adults and 20 to 34% in children, fruit juices excluded), and dairy products (4 to 15% in adults and 6 to 18% in children) [13].

The important aspect is to answer the question regarding how many among the fermented dairy products available in the

Table II. Nutrition (energy value, carbohydrates, fats, proteins) in the flavoured kefirs – information on the food labels from the lowest to the highest carbohydrate content

No.	Brand	Name of the kefir	The nutrition value in a 100 g			
			Energy (kcal)	Carbohydrates (g)	Fats (g)	Proteins (g)
1	Maluta	Avran	36.00	3.40	2.20	1.50
2	Somlek	Kefir with cucumber and dill	49.00	5.00	1.80	3.20
3	Mleczna dolina	Kefir with cucumber and garlic	53.00	5.60	1.90	3.30
4	Paturages	Kefir with forest fruits	50.00	9.00	0.05	3.30
5	Jovi	Kefir with cranberries	50.00	9.00	0.05	3.30
6	Sunmilk	Kefir light forest fruits	51.00	9.00	0.10	3.40
7	OSM Rawicz	Kefir strawberry	66.00	10.00	1.50	3.20
8	Piątnica	Dessert kefir with plum jam	108.00	10.50	5.90	3.00
9	Kaufland	Kefir with vanilla flavour	66.00	10.50	1.30	3.00
10	Jan	Kefir refreshing with strawberry	66.00	10.50	1.30	3.00
11	Piotr i Paweł	Kefir strawberry	66.00	10.50	1.30	3.00
12	Jovi	Kefir with appetizing strawberry	67.00	10.70	2.80	1.30
13	Tola	Kefir prune	67.00	10.70	1.30	3.00
14	Piątnica	Kefir with cherry and apple jam	108.00	10.70	5.30	3.00
15	Pilos	Kefir just fit	59.00	11.00	0.10	3.40
16	OSM Grodzisk	Kefir 0% with vanilla	60.00	12.00	0.05	6.00
17	Helios	Kefir strawberry – honey	62.00	12.10	0.00	6.60
18	Carrefour	Flavoured jumbo	65.00	12.90	0.10	3.40
19	Jan	Kefir with chocolate	76.00	12.90	1.50	2.60
20	FigAND	Kefir forest fruits	67.00	13.10	0.05	3.40
21	Isolda	Kefir strawberry	81.00	14.00	2.00	3.00
22	Jagr 200	Kefir apricot	82.00	14.80	1.50	2.40
23	Milbona	Kefir mild berry	142.00	16.30	7.40	2.40
24	Lanfein	Kefir Sahne	144.00	16.60	7.50	2.30
25	Biedronka	Kefir with forest fruits	130.00	22.00	0.00	8.00
MEAN			74.84	11.32	2.04	3.36

Table III. The comparison of mean nutrition (energy value, carbohydrates, fats, proteins) between the 2 studied groups of kefirs – natural vs. flavoured

Nutritional value	Mean \pm SD		P-value for Student's <i>t</i> -test
	Natural kefirs	Flavoured kefirs	
Energy value in 100 g (kcal)	46.1 \pm 6.103	74.84 \pm 29.09	< 0.001
Carbohydrate contents in 100 g of the product (g)	4.67 \pm 0.67	11.31 \pm 3.83	< 0.001
Fats contents in 100 g of the product (g)	1.64 \pm 0.66	1.88 \pm 2.26	0.608
Proteins contents in 100 g of the product (g)	3.14 \pm 0.69	3.36 \pm 1.46	0.504

Polish market fulfil the norms of the previously mentioned act [7]. The authors have not found the answer in available publications. According to their own and the quoted research, one could conclude with a reasonable level of certainty that it is a small percentage of fermented milk products available in Poland. It was established in this study that 34% of all examined milk products contained the appropriate amount of carbohydrates. For example, the analysis from Great Britain reported that only 9% of the yoghurts available on the market contained the recommended (≤ 5 g/100 g) quantity of carbohydrates [14]. The results obtained in Ireland were slightly more optimistic, reporting that out of 486 studied flavoured yoghurts available, 37% contained an appropriate (≤ 5 g/100g) amount of carbohydrates [15].

The latest reports regarding carbohydrate content in dairy products dedicated to children are noteworthy. The observations of Lythgoe revealed higher free sugar content in milk products for children than in their standard equivalents [16]. According to the WHO, free sugars are sugars added to beverages and food by the producer, cook, or consumer as well as sugars naturally occurring in honey, fruit juices, syrups, and fruit juice concentrate [17]. Another analysis of yoghurts for children in Great Britain, Equador, Guatemala, and Mexico revealed alarmingly high carbohydrate content. According to the results, the average carbohydrate content in the yoghurts in the previously mentioned countries exceeded the EU recommended carbohydrate content (5 g/100 g) at least fivefold [18]. It is acknowledged that consumption of high-quality fermented milk products significantly influences diet quality. This fact is particularly significant regarding children experiencing intense growth. The publication by Hobbs serves as an example. The authors documented that daily yoghurt consumption above 60 g in children between 4 and 10 years of age contributes to lowering blood pressure and in children between 11 and 18 years of age to lowering of HbA1c level [19]. Also, Zhu noted that consumption of fermented dairy products by children contributes to an increase in phosphorus, calcium, magnesium, and potassium intake, simultaneously lowering fat and sodium consumption [20]. Nevertheless, as indicated above, fermented dairy products dedicated to children often present less favourable contents than products without such dedication.

According to the food pyramid, the healthy eating plate, and current dietary guidelines of Polish National Institute of Public Health - National Institute of Hygiene, it is recommended that 2 portions of dairy products are incorporated in our everyday diet. As a result, consuming flavoured, fermented dairy products could lead to exceeding the daily recommended carbohydrate intake [21]. This fact seems to be amplified by the constantly growing popularity of flavoured products. The wide availability of such products is one of the main determinants of the consumers' choices [11].

Data printed on the label enables the consumer to assess the nutritional value of a particular product. The label of each product ought to contain information regarding the content of sugars and sweeteners. The role of such information is to protect the consumer against eating products with potentially unfavourable contents [22]. The Vargas-Meza study from 2019 conducted among Mexican consumers confirmed the importance of clear labelling of products. According to its results, clear labelling of food items contributes to better dietary choices among consumers [23].

In the flavoured milk products, the most common flavoured addition, apart from added sugars, is processed fruit, which contains significant amounts of carbohydrates. Considering that currently the producers have no obligation to inform about the amount of added sugars on the label, the consumer is not able to determine how much of the carbohydrates mentioned on the label come from flavoured additives [20]. Dairy fermented products enriched by flavoured additives prove high stability of polyphenolic compounds and anthocyanins in cooling conditions, which is important for the producers [24]. Therefore, it should be noted that introducing the obligation to give more detailed labelling regarding carbohydrate content in flavoured fermented dairy products, e.g. the amount of added sugars, or the control their amount per 100 g of the product, seems necessary.

A diet rich in simple carbohydrates is widely recognised as one of the main causes of being overweight and obese. It is vital to follow the guidelines limiting the consumption of products containing their large quantity, including milk products [25]. Strategies of reduction of added sugars are present in health policy programs in Poland and many other countries [26]. Multiple studies indicate that government initiatives have

a positive influence on sugar intake reduction, and they result in improvement of health. An example of that is the analysis by Hashem, published in 2019, concerning the initiatives of sugar intake reduction. It proved that such initiatives can reduce sugar consumption by up to 11%, which corresponds with a reduction

of sugar intake of 91 g per day [27]. Multiple studies confirm the positive influence of reduction of sugar consumption on the occurrence of body weight and obesity [28]. The strategy mentioned above might be aided by information regarding the analysis of the rejection threshold of fermented dairy prod-

Table IV. The nutrition (energy value, carbohydrates, fats, proteins) in the natural yoghurts –information on the food labels from the lowest to the highest carbohydrate content

No.	Brand	The name of the yoghurt	Energy value in 100 g			
			Energy (kcal)	Carbohydrates (g)	Fats (g)	Proteins (g)
1	Piątnica	Greek-type yogurt 0% fat	51.00	4.10	0.00	8.70
2	Zott	Natural yogurt	67.00	4.20	3.00	4.90
3	Candia	Greek-style natural yogurt	121.00	4.40	10.00	3.30
4	Lidl Biotred	Bio yogurt [EKO]	72.00	4.70	3.50	5.00
5	Zott	Natural yogurt Jogo Vita	52.00	4.80	1.00	5.10
6	Bakoma	Natural yogurt Greek type	102.00	4.90	7.50	3.70
7	Biedronka Tolonis	Natural yogurt Greek type	125.00	5.00	10.00	3.80
8	Łowicz	Yogurt Greek	125.00	5.00	10.00	3.80
9	Mlekovita	Natural yogurt Greek type	115.00	5.00	9.00	3.60
10	Biedronka Tola	Yogurt natural	57.00	5.10	2.50	3.50
11	Danone	Activia natural	69.00	5.10	3.40	4.50
12	Bakoma	Natural thick yogurt	60.00	5.20	2.80	3.60
13	Lidl Pilos	Yogurt natural 2.5%	61.00	5.20	2.50	4.30
14	Mlekovita	Natural polish yogurt	55.00	5.30	2.00	3.90
15	Bieluch	Natural light yogurt 0%	38.00	5.50	0.00	4.00
16	Biedronka Tola	Natural yogurt with calcium	58.00	5.70	2.00	4.30
17	Lidl Pilos	Natural yogurt 2%	58.00	5.70	2.00	4.30
18	Danone	Natural mild yogurt	69.00	5.80	3.00	4.60
19	Piątnica	Natural yogurt	58.00	5.90	2.00	4.00
20	Krasnystaw	Natural yogurt	58.00	6.00	2.00	4.10
21	Krasnystaw	Natural yogurt Calpro	60.00	6.00	2.00	4.50
22	Biedronka Tola	Natural creamy yogurt	70.00	6.30	3.00	4.40
23	Candia	Greek style natural light yogurt	74.00	6.40	3.50	4.20
24	Bakoma	Natural yogurt mild taste	63.00	7.30	1.50	5.00
25	Bakoma	Natural yogurt 0%	52.00	7.60	0.00	5.50
MEAN			71.60	5.45	4.00	4.42

ucts by the consumer. The rejection threshold is the minimum amount of a particular ingredient below which the product stops being attractive in the consumer's opinion [29]. According to Hashem, the carbohydrates can be effectively reduced to half

of the initial amount. The quoted research and the conclusions should be taken into consideration while devising new guidelines regarding fermented dairy products as well as shaping consumers' awareness and therefore the health of the society.

Table V. The nutrition (energy value, carbohydrates, fats, proteins) in the flavoured yoghurts – information on the food labels from the lowest to the highest carbohydrates content

No.	Brand	The name of the yoghurt	Energy value in 100 g			
			Energy (kcal)	Carbohydrates (g)	Fats (g)	Proteins (g)
1	Danone	Strawberry yogurt	71.00	11.10	1.60	2.80
2	Zott	Yogurt with honey	88.00	11.60	2.50	3.90
3	Zott	Yogurt with strawberry	90.00	12.00	2.70	3.50
4	Krasnystaw	Pear yogi	83.00	12.50	2.50	2.50
5	Piątnica	Piątuś	105.00	13.00	3.00	6.20
6	Danone	Yogurt with sponge cakes	122.00	13.40	4.10	2.80
7	Bakoma	BIO yogurt with plum and muesli	90.00	13.70	2.30	3.50
8	Zott	Yogurt with coconut balls	97.00	13.70	2.70	3.50
9	Danone	Yogurt with coconut balls	145.00	14.10	8.50	3.10
10	Bakoma	BIO yogurt with plum	93.00	14.20	2.50	3.40
11	Piątnica	Yogurt 0% fat with berries	78.00	14.40	0.00	7.00
12	Mlekovita	Yogurt polish with peach	92.00	14.60	2.50	2.80
13	Zott	Yogurt strawberry - wild strawberry	100.00	14.80	2.60	3.50
14	Mlekovita	Vanilla yogurt	99.00	15.00	2.50	2.80
15	Bakoma	Yoghurt men	93.00	15.20	2.40	2.90
16	Lidl Pilos	Yogurt with peach	101.00	15.50	2.30	3.70
17	Danone	Fantasy with tangerine	121.00	15.90	5.30	2.30
18	Danone	Fantasy with white chocolate	168.00	16.00	10.10	3.20
19	Danone	Fantasy with milk chocolate	166.00	16.90	9.30	3.30
20	Lidl Pilos	Yogurt with passion fruit	107.00	17.20	2.20	1.70
21	Danone	Gratka	73.00	17.60	1.30	1.80
22	Bakoma	Creamy yogurt with peach mousse	119.00	18.00	4.30	2.10
23	Danone	Twisted yogurt	118.00	19.40	3.30	2.50
24	Bakoma	Yogurt for the senses	152.00	19.80	6.80	2.60
25	Bakoma	Creamy yogurt with fruit and gronola ggranola moussegranola mousse	152.00	21.50	5.80	2.90
MEAN			108.92	15.25	3.73	3.21

Table VI. Comparison of mean nutrition (energy value, carbohydrates, fats, proteins) between the 2 studied groups of yoghurts – natural vs. flavoured

Nutritional value	Mean \pm SD		P-value for Student's <i>t</i> -test
	Natural yoghurts	Flavoured yoghurts	
Energy value in 100 g of the product (kcal)	71.6 \pm 25	108.92 \pm 28.11	< 0.001
Carbohydrates content in 100 g of the product (g)	5.45 \pm 0.85	15.24 \pm 2.61	< 0.001
Fat content in 100 g of the product (g)	3.53 \pm 3.14	3.72 \pm 2.54	0.808
Protein contents in 100 g of the product (g)	4.42 \pm 1.05	3.21 \pm 1.17	< 0.001

Table VII. Comparison of the mean nutrition value (energy value, carbohydrates, fats, proteins) between studied groups of fermented milk products: natural kefir – A, natural yoghurts – B, flavoured kefir – C, flavoured yoghurts – D

Nutritional value	Natural kefir (A)	Natural yoghurts (B)	Flavoured kefir (C)	Flavoured yoghurts (D)	The value for the ANOVA Test
Mean energy value in 100 g of the product (kcal)	46.1 B,C,D	71.6 C,D	74.84 C,D	108.92 A,D	< 0.001
Mean carbohydrates value in 100 g of the product (kcal)	4.67 C,D	5.45 C,D	11.31 A,B,D	15.24 A,B,C	< 0.001
Mean fat value in 100 g of the product (kcal)	1.64 B,D	3.53 C,D	1.88 A,B,D	3.72 A,C	< 0.001
Mean protein value in 100 g of the product (kcal)	3.14 B	4.42 A,C,D	3.36 B	3.21 B	< 0.001

Limitations of the study

It was impossible to determine the content of free sugars in the products due to a lack of such information on the food labelling. The studied products were not analysed depending on the type of free sugar added (to determine the amount of added saccharose, glucose-fructose syrup, and fructose).

Conclusions

Natural kefir and yoghurts available for the Polish consumer are the most beneficial fermented milk products.

References

1. FAO/WHO Food Standards Programme, Distribution of the report of the thirty-fifth session of the codex committee on food additives and contaminants, 2003, 56, https://www.maff.go.jp/j/sy-ouan/nouan/kome/k_cd/04_kijyun/attach/pdf/01_int-1.pdf (Access 3.05.2021).
2. Pasin G, Comerford KB. Dairy foods and dairy proteins in the management of type 2 diabetes: a systematic review of the clinical evidence. *Adv Nutr* 2015; 6: 245–259. doi: 10.3945/an.114.007690.
3. Fernandez A, Panahi S, Daniel N, et al. Yogurt and Cardiometabolic Diseases: A Critical Review of Potential Mechanisms, *Adv Nutr* 2017; 8: 812–829.
4. Szwedziak K, Antczak D. Health properties of flavored yogurt. *Postępy Techniki Przetwórstwa Spożywczego* 2016, 1: 19–21.
5. Gueimonde M, Salminen S. The role of yogurt in food-based dietary guidelines. *Nutr Rev* 2018; 76 (Suppl 1): 29–39. doi: 10.1093/nutrit/nuy059.
6. Stankiewicz J, Kwiatkowska E. Assessment of the Influence of the Flavour Additive on the Size of Lactic Acid Bacteria Population in

We confirm that out of the dairy fermented products available in Poland, mostly natural kefir fulfil the criteria of the European Parliament and Council Act (UE) no. 1924/2006 from 20 December 2006 nutrition and health claims made on foods.

Acknowledgements

Special thanks to Mr Peadar De Burca who checked the English language standard of the article.

- a Selected Food Product Intended for Special Medical Purposes, *Scientific Journal of Gdynia Maritime University* 2018; 104: 55–62.
7. Regulation (ec) No 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods, <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:404:0009:0025:En:PDF> (Access: 3.05.2021).
 8. Mitchell N, Catenacci V, Wyatt H, et al. Obesity: overview of an epidemic. *Psychiatr Clin North Am* 2011; 34: 717–732. doi: <https://doi.org/10.1016/j.psc.2011.08.005>.
 9. Jeschke A, Obesity – the epidemic of the XXIst century – can you fight it with fiscal methods? *Journal of Health Policy, Insurance and Management* 2018; 43–54.
 10. Fidler Mis N, Braegger C, Bronsky J, et al. Sugar in Infants, Children and Adolescents: A Position Paper of the European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. *J Pediatr Gastroenterol Nutr* 2017; 65: 681–696. doi: [10.1097/MPG.0000000000001733](https://doi.org/10.1097/MPG.0000000000001733)
 11. Wierzejska R, Siuba-Strzeleńska M, Jarosz M. Evaluation of dairy products available on the Polish market in the context of nutrient profiles. Clear arguments for reformulation of foodstuffs. *Rocznik Panstw Zakl Hig* 2017; 68: 43–50.
 12. Coyle DH, Ndanuko R, Singh S, Huang P, Wu JH. Variations in Sugar Content of Flavored Milks and Yogurts: A Cross-Sectional Study across 3 Countries. *Curr Dev Nutr* 2019; 3: nzz060. doi: [10.1093/cdn/nzz060](https://doi.org/10.1093/cdn/nzz060).
 13. Azaïs-Braesco V, Sluik D, et al. A review of total & added sugar intakes and dietary sources in Europe. *Nutr J* 2017; 16: 6. doi: [10.1186/s12937-016-0225-2](https://doi.org/10.1186/s12937-016-0225-2)
 14. Moore B, Horti A, Fielding B, Evaluation of the nutrient content of yogurts: a comprehensive survey of yogurt products in the major UK supermarkets. *BMJ Open* 2018; 18: 1–7.
 15. Kemp B, White-Flynn T, Lyons O, et al. Is it yoghurt or is it a dessert? *Proceedings of the Nutrition Society* 2017; 76. doi: [10.1017/S0029665117001422](https://doi.org/10.1017/S0029665117001422).
 16. Lythgoe A, Roberts C, Madden AM, Rennie KL. Marketing foods to children: a comparison of nutrient content between children's and non-children's products. *Public Health Nutr* 2013; 16: 2221–2230. doi: [10.1017/S1368980013000943](https://doi.org/10.1017/S1368980013000943).
 17. WHO calls on countries to reduce sugars intake among adults and children <https://www.who.int/news/item/04-03-2015-who-calls-on-countries-to-reduce-sugars-intake-among-adults-and-children> (Access: 3.05.21).
 18. Garcia A, Ronquillo J, Morillo-Santander G, et al. Sugar Content and Nutritional Quality of Child Orientated Ready to Eat Cereals and Yoghurts in the UK and Latin America; Does Food Policy Matter? *Nutrients* 2020, 12: 856. doi: [10.3390/nu12030856](https://doi.org/10.3390/nu12030856).
 19. Hobbs DA, Givens DJ, Lovegrove JA. Yogurt consumption is associated with higher nutrient intake, diet quality and favourable metabolic profile in children: a cross-sectional analysis using data from years 1-4 of the National Diet and Nutrition Survey, UK. *Eur J Nutr* 2019; 58: 409–422. doi: [10.1007/s00394-017-1605-x](https://doi.org/10.1007/s00394-017-1605-x).
 20. Smith Z, Benoit V, Jain N, et al. Yogurt Consumption Is Associated with Better Dietary Intake and Diet Quality in School-aged Children. *Curr Develop Nutr* 2019; 3: 112–119.
 21. Bucher T, Collins C, Rollo M, et al. Nudging consumers towards healthier choices: a systematic review of positional influences on food choice. *Br J Nutr* 2016; 115: 2252–2263.
 22. Nawrot K. The Role of Information on the Label in the Process of Choosing Food Products. *Intercathedra* 2020; 1: 33–40.
 23. Vargas-Meza J, Jáuregui A, Pacheco-Miranda S, et al. Front-of-pack nutritional labels: Understanding by low- and middle-income Mexican consumers. *PLoS One* 2019; 14: 1–16.
 24. Raikos V, Ni H, Hayes H, et al. Antioxidant Properties of a Yogurt Beverage Enriched with Salal (*Gaultheria shallon*) Berries and Blackcurrant (*Ribes nigrum*) Pomace during Cold Storage. *Beverages* 2019; 5: 1–11.
 25. Coyle D, Ndanuko R, Singh S, et al. Variations in Sugar Content of Flavored Milk and Yogurts: A Cross-Sectional Study across 3 Countries. *Community and Global Nutrition*, 2019; 1–6.
 26. Tedstone A, Owtram G, Montel S, et al. Sugar reduction: juice and milk based drinks. A technical report outlining guidelines for industry, 2017 baseline levels for drinks in scope and next steps. *Public Health England* 2018; 3–39.
 27. Hashem K, He F, MacGregor G. Effects of product reformulation on sugar intake and health – a systematic review and meta-analysis. *Nutr Rev* 2019; 77: 181–196. doi: [10.1093/nutrit/nuy015](https://doi.org/10.1093/nutrit/nuy015).
 28. Yeung C, Gohil P, Rangan A, et al. Modelling of the impact of universal added sugar reduction through food reformulation. *Sci Rep* 2017; 7: 1–8. doi: [10.1038/s41598-017-17417-8](https://doi.org/10.1038/s41598-017-17417-8).
 29. Torrico D, Tam J, Fuentes S, et al. Consumer rejection threshold, acceptability rates, physicochemical properties, and shelf-life of strawberry-flavored yogurts with reductions of sugar. *J Sci Food Agric* 2020; 100: 3024–3035. doi: [10.1002/jsfa.10333](https://doi.org/10.1002/jsfa.10333).