

SENSORY EVALUATION AND CONSUMPTION PREFERENCES OF HIGH-PROTEIN NATURAL YOGHURTS AMONG STUDENTS OF DIETETICS

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ABSTRACT

Background. High-protein yoghurts, are recommended by dietitians as a valuable source of wholesome protein. Consumers' expectations of yoghurts are intrinsically linked to the perceived quality and health benefits of these products.

Objective. The aim of this research study was the sensory analysis and evaluation of consumer preferences towards commercially available high-protein natural yoghurts. The study was designed to identify which quality and nutritional characteristics are crucial for dietetics students when choosing such products. Moreover, the factors influencing the purchasing decisions of this group were analysed, which can provide valuable information for food producers and dietitians.

Materials and Methods. The research study was conducted among 65 students of dietetics at the Medical University of Silesia in Katowice. The examination included the sensory evaluation of eight high-protein yoghurts by means of a five-point rating scale and the analysis of consumer preferences based on a proprietary questionnaire, which consisted of questions concerning the characteristics of the study group and questions assessing consumer preferences and dietary habits.

Results. Among the surveyed students of dietetics, 35.4% declared to consume high-protein yoghurts several times a week, mainly due to 'positive health benefits'. In the conducted sensory evaluation, yoghurts of brands 'A', 'C' and 'E' scored highest, while the plant-based alternative of brand 'D' scored lowest.

Conclusions. The high-protein yoghurts of brands 'A', 'C' and 'E' outstand in terms of taste and texture, which makes them the most popular products among consumers. Products from 'A', 'C' and 'B' brands are also widely available on the market, which favours their popularity. Taste proved to be a key factor in the decision to re-purchase. The largest number of respondents stated their willingness to purchase 'A' brand yoghurt again, while 'D' and 'F' brand products were the least popular, which may be due to differences in taste preferences and the availability of these products on the market.

Key words: *sensory evaluation, consumption preferences, consumer preferences, high-protein yoghurts, natural yoghurts*

INTRODUCTION

There is a constant increase in the production of milk and dairy products among Polish producers nowadays [1]. As compared to traditional dairy yoghurts, the lower preference for plant-based alternatives may result from their different textural and taste properties [2].

Originally, yoghurts were only available in their natural form, but manufacturers are increasingly diversifying their range of products by adding a variety of fruit and cereal ingredients to create ever-new flavours [3, 4, 5]. Innovative products are constantly being introduced to cater for the various dietary preferences of potential consumers, including not only fermented milk drinks and cheese, but also buttermilk

and kefir [3]. Moreover, the offered dairy products have different nutritional values and organoleptic properties that allow them to be differentiated according to their tenacity, compactness, density, hardness, as well as the texture they possess (liquid, thick, mixed) [6].

Over recent years, there has been an increase of nutritional knowledge and awareness among consumers in recent years, who more often expect food that fulfils certain alimentary, dietary and nutritional standards, such as reduced sugar content or the absence of artificial preservatives [7, 8]. The nutritional value of natural yoghurts is particularly related to their chemical composition and the form of the ingredients, which facilitates the absorption, digestion and assimilation of nutrients [9].

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Natural yoghurts are the healthiest choice recommended by nutritionists and the FFC (*Functional Food Centre*). These products have potentially more nutritious composition compared to milk and are identified as ‘functional food’, which contains biologically active compounds that provide clinically documented health benefits, in preventing and treating diseases, even chronic ones. The composition of such products should be based solely on live bacteria cultures and substances of dairy origin, and should eschew unnecessary additives such as flavourings, colourings, thickeners or flavour enhancers [3, 10].

Regular consumption of natural yoghurts, rich in probiotic bacteria such as *Lactobacillus* and *Bifidobacterium*, provides excellent cancer prevention, especially of the large intestine, improves intestinal peristalsis during the postpartum period, prevents the occurrence of diarrhoea, reduces the risk of pre-diabetes type II and improves lipid profile [3].

An increased amount of protein in a portion of yoghurt, will be beneficial in individuals who reduce body weight, as it will improve the feeling of satiety, thereby improving appetite control [11]. For physically active people whose muscles require adequate recovery after intense exercise, a rapid intake of protein following a training unit affects the phosphorylation of signalling proteins, hence increasing muscle protein synthesis [12]. However, among the elderly struggling with malnutrition or osteoporosis, a condensed form of protein yoghurt will provide the necessary amount of protein and calcium in a small portion [13].

Consumers’ expectations of yoghurts are intrinsically linked to the perceived quality and health benefits of these products. Consumers look for freshness, proper texture and optimum level of acidity in yoghurt, all of which are identified with a healthy and natural product. Sensory research, extensively discussed by Samotyja [14], indicates that the food sensory appeal, including taste, fragrance and texture, plays a key role in consumers’ purchasing decisions. These qualities highly influence the satisfaction with the product and, in the context of yoghurts, pro-health aspects, such as probiotic content and natural ingredients, which can enhance consumer loyalty, are also gaining importance.

In the context of research on yoghurts, analysing consumer preferences through sensory evaluations allows products to be better aligned with market expectations [14].

The objectives and assumptions of the research study

The main objective of the conducted research study was a sensory and consumer preference analysis of high-protein natural yoghurts available on the market, in order to identify which quality and nutritional

characteristics are crucial for dietetic students when choosing this type of product. The study also aimed at identifying which yoghurt brands are best suited to meet the dietary expectations of this group and to determine the factors that contribute to repetitive purchase.

The following specific objectives have achieved the main goal:

- To conduct a sensory evaluation of selected brands of high-protein yoghurts available on the Polish market, with particular emphasis on the quality of taste and texture.
- To analyse the high-protein yoghurt market in terms of its availability to consumers.
- To determine which high-protein yoghurts are most valued by students of dietetics, both in terms of nutritional value and taste preferences.
- To identify the yoghurts that are most frequently chosen by students of dietetics for their dietary requirements.
- To examine the quality and nutritional criteria that influence dietetic students’ choice of specific brands of high-protein yoghurt and the factors that determine their purchase.

MATERIAL AND METHODS

Course of the study and research group

The research study was conducted among 65 students of dietetics at the Medical University of Silesia in Katowice, at the Faculty of Public Health in Bytom, in 2023 (57 women and 8 men).

Inclusion criteria for the research study included: providing informed consent for participation in the study, confirming status as a first- or second-cycle dietetics student and completing a questionnaire. Exclusion criteria, on the other hand, included: the absence of student status or a different field of study than the one mentioned above. Participation in the study was voluntary and anonymous. Data were collected among students attending classes held between December 2023 and February 2024 at the Department of Dietetics at the Medical University of Silesia in Katowice, where product evaluation workstations were arranged. The study group was represented by people aged between 19 and 30 years.

The study material consisted of 8 natural high-protein yoghurts from different companies and stores (Table 1).

The research study was conducted in the sensory analysis laboratory of the Department of Dietetics at the Medical University of Silesia in Katowice, at the Faculty of Public Health in Bytom, which fulfils the requirements and assumptions of the PN-EN ISO 8589:2010 standard for sensory laboratories [15].

Table 1. Types of high-protein yoghurts applied in the research study*

Food product	Sample designation	Qualitative composition
Natural skyr	A	pasteurized milk, live yoghurt bacteria cultures: <i>Str. thermophilus</i> , <i>L. bulgaricus</i>
Natural yoghurt, high protein	B	skimmed milk, milk proteins, yoghurt bacteria cultures (contain milk), lactase
Natural skyr, Icelandic yoghurt	C	pasteurized milk, live yoghurt bacteria cultures: <i>Str. thermophilus</i> , <i>L. bulgaricus</i>
Vegan alternative	D	soybean base (water, peeled soybeans (15.7%)), sugar, stabiliser (pectin), tricalcium citrate, acidity regulators (sodium citrates, citric acid), natural flavours, sea salt, antioxidants (tocopherol-rich extract, fatty acid esters and ascorbic acid), vitamins (B ₁₂ , D ₂), yoghurt cultures (<i>Str. thermophilus</i> , <i>L. bulgaricus</i>)
Natural yoghurt of the Icelandic type	E	condensed skimmed milk, cream, milk proteins, yoghurt bacteria cultures
Natural skyr	F	skimmed milk, cultures of lactic acid bacteria, microbiological rennet, pasteurized milk, live yoghurt bacteria cultures: <i>Str. thermophilus</i> i <i>L. bulgaricus</i>
Natural yoghurt, high protein, 0% fat, lactose free	G	pasteurized milk, live yoghurt bacteria cultures
Natural protein yoghurt	H	milk, yoghurt bacteria cultures

*Own study based on food labels

The prepared yoghurt samples were designated with three-digit codes. Each person participating in the evaluation received 8 samples, which contained approximately 50 g of product. While conducting the research study, sensory evaluation (colour, fragrance, texture, appearance and taste) was performed. The order of the analysed characteristics was not accidental. The evaluation of the quality of high-protein yoghurts was conducted by means of a proprietary evaluation card containing a five-point scale (5 – very good product quality, 1 – disqualifying quality of the tested product), prepared on the basis of PN-ISO 22935-1 [16].

All participants taking part in the conducted tests were given a set of 8 coded samples of a certain weight for evaluation. In addition, the participants of the research study were given cards with enumerated quality indicators for all tested characteristics and a sheet used for sensory evaluation of the examined samples. For each tested characteristic, an importance coefficient was determined by multiplying the numerical scores awarded by the evaluators.

The chosen five-point method was applied because of its adequate level of difficulty, which was adapted to the skills and experience of the group of participants of the study.

In the study, an importance coefficient (IC) was used to assign appropriate significance to the different sensory evaluation criteria and product availability. This coefficient was designed to consider the different relevance of individual characteristics, such as taste,

colour, texture, appearance and fragrance, when calculating the overall rating of the high-protein yoghurts. The value of the coefficient was based on the opinions of students of dietetics and the results of previous studies, which indicated which characteristics have the greatest influence on consumers' purchasing decisions [17]. Importance coefficients were used in the analysis of the questionnaire data to distinguish those characteristics that had the greatest influence on respondents' choice of products.

Proprietary questionnaire

The second element of the research was aimed at assessing preferences and behaviours regarding the consumption of high-protein natural yoghurts. For that purpose, a proprietary questionnaire was developed. The first part of the questionnaire contained questions concerning the characteristics of the study group, while the second part included 13 closed, single-choice questions assessing consumer preferences and dietary habits. The self-designed questionnaire guaranteed the anonymity of respondents, who were informed about the purpose of the research study, its methodology and agreed to participate.

Statistical analysis

All data obtained were catalogued and analysed through Microsoft 365 Excel 2024 and Statistica StatSoft Polska. The distribution of each parameter was checked with the Shapiro-Wilk test. A t-test for dependent samples was applied to analyse the

parametric data. Cramér's V (V_c) coefficient was used to determine the strength of the association. The level of statistical significance, $p < 0.05$, was adopted in the calculations.

RESULTS

Characteristics of the research group and consumer behaviour Sixty-five respondents participated in the research study. The vast majority of interviewees (87.7%) were women – 57 people while the male group was represented by 8 people (12.3%). The average age of the respondents was (\bar{x} =22.0 years). 44 individuals constituted the group of first-cycle studies students (67.3%), while 21 participants attended second-cycle studies (32.3%). The majority of respondents (60 persons) declared that they consume high-protein yoghurts, which accounts for 92% of the people involved. Five individuals do not consume such products at all (8%).

Twenty-three persons of all respondents declared that they consume natural high-protein yoghurts 'several times a week' (35.4%), while 19 persons indicated that they ingest them 'several times a month' (29.2%). 4,6% of respondents stated that they consume yoghurts 'less frequently than the above answers' (Figure 1).

Students who undertake employment declared consumption of high-protein yoghurts 'every day', more often than students who don't work: 23.3% and 5.7% respectively (Table 2). In both groups, students consumed high-protein yoghurts most frequently 'several times a week' 30.0% and 40.0% accordingly. There is a statistically significant correlation between the respondents' professional activity and the frequency of consumption of high-protein natural yoghurts ($p < 0.05$). The strength of the correlation is moderate ($V_c = 0.367$).

Yoghurt from the 'A' company was chosen by 17 respondents (48.6%) who declared themselves as professionally inactive students, while in the case of

employed students, yoghurt from the 'B' company was the most common choice with 10 individuals (33.3%).

There is a statistically significant correlation between the respondents' work activity and the preferred company for natural high-protein yoghurts ($p < 0.05$). The strength of the correlation is moderate ($V_c = 0.377$).

When asked about the reasons for purchasing natural high-protein yoghurts, 72% of respondents stated that they choose them for the positive health and nutritional benefits, while 17% of participants indicated that they buy them 'for the taste'.

Almost all respondents (92.3%) purchase the discussed products in supermarkets/ discount retailers. The remaining people surveyed, do not buy natural high-protein yoghurts (6.2%).

Respondents participating in the questionnaire are most likely to buy yoghurt cups of >150 g and ≤ 200 g (43.1%) and ≥ 100 g and ≤ 150 g (40.0%) (Table 3). For more than half of the students, the most preferred texture of the yoghurts they purchase is the traditional one, to be consumed with a spoon (53.8%), followed by the dense texture (29.2%) and the liquid form (13.8%). As far as respondents' taste preferences are concerned, they are diverse, but the leading choice is natural yoghurt (38.5%), flavoured (fruit) yoghurt accounting for 6.9% and non-fruit flavoured yoghurt accounting for 20.0%. Plant-based yoghurts are not among the preferred flavours of respondents. The prices of yoghurts that students most often buy are between >2.50 PLN and ≤ 3.50 PLN (46.2%) and between >3.50 PLN and ≤ 5.50 PLN (40.0%).

When asked about the most common way of consuming natural high-protein yoghurt, 27 respondents (41.5%) indicated the answer as a 'stand-alone meal/snack', 24 people (36.9%) selected the answer as a 'meal/snack accompaniment' and the least frequent mode of yoghurt consumption was as a 'food and/or dessert ingredient' (16.9%).

The information on the yoghurt packaging has an impact on purchase decisions for more than half

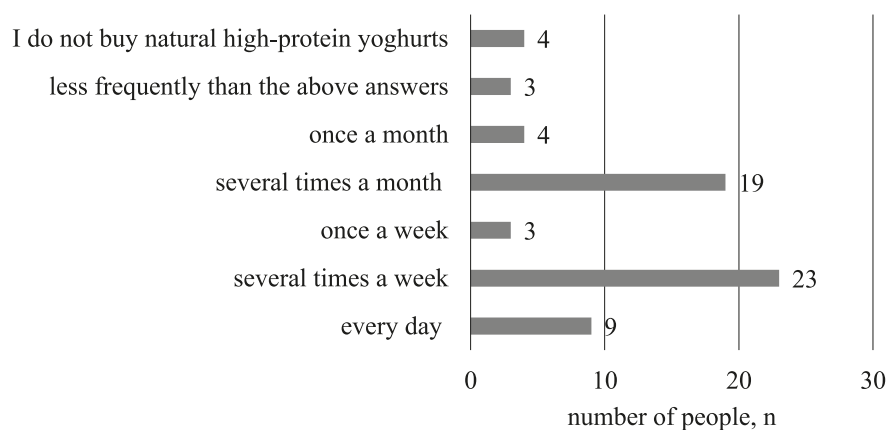


Figure 1. Frequency of consumption of natural high-protein yoghurts

Table 2. Respondents' professional activity as compared to frequency of consumption of high-protein natural yoghurts, n=65

		Respondents' professional activity		p-value	Cramér's V	Strength of correlation
		Student who don't work n=35	Professionally active student n=30			
		n (%)	n (%)			
Frequency of consumption of natural high-protein yoghurts	Every day	2 (5.7%)	7 (23.3%)	0.000	0.367	Moderate
	Several times a week	14 (40.0%)	9 (30.0%)			
	Once a week	2 (5.7%)	1 (3.3%)			
	Several times a month	13 (37.1%)	6 (20.0%)			
	Once a month	1 (2.9%)	3 (10.0%)			
	Less frequently than the above	2 (5.7%)	1 (3.3%)			
	I do not buy natural high-protein yoghurts	1 (2.9%)	3 (10.0%)			

Table 3. Characteristics of the most popular natural high-protein yoghurts, n=65

Analysed product feature		n	%
Yoghurt package size	<100 g	1	1.5
	≥100 g and ≤150 g	26	40.0
	>150 g and ≤200 g	28	43.1
	>200 g	4	6.2
	I do not pay attention to the size of the package	3	4.6
	I do not buy natural high-protein yoghurts	3	4.6
Yoghurt texture	traditional (to be consumed with a spoon)	35	53.8
	dense	19	29.2
	liquid (drinking yoghurt)	9	13.8
	foamy, mousse-like texture	2	3.1
Taste of yoghurt	natural	25	38.5
	fruit flavoured (e.g. strawberry, blueberry)	24	36.9
	flavoured – other than fruit (e.g. vanilla, chocolate)	13	20.0
	plant-based	0	0.0
	I do not buy such products	3	4.6
Price of yoghurt	>1.00 PLN and ≤2.50 PLN	6	9.2
	>2.50 PLN and ≤3.50 PLN	30	46.2
	>3.50 PLN and ≤5.50 PLN	26	40.0
	>5.50 PLN	0	0.0
	I do not buy natural high-protein yoghurts	3	4.6

of respondents (61.5%), while 18.5% claimed it was not influential and 20.0% of respondents were are indecisive about its importance.

When asked what determinants the respondents follow when choosing particular yoghurt, 31 people (47.7%) stated that the price of the products they purchase is a big determinant (Table 4). Within the group of respondents, 22 people (33.8%) declared that the brand was of average importance. On the other hand, 33 respondents (50.8%) indicated that the size of

the packaging is an influential factor in their purchases. The composition of the products (43.1%), taste (64.6%) and expiry date (49.2%) were of huge importance to those taking part in the survey. The product promotion was however of average importance, when it came to potential consumers' choice (35.4%).

To the question of whether the interviewees had previously tried the tested product, they gave the greatest number of affirmative answers for products such as 'A' (89.2%) and 'C' (81.5%). Conversely, they

Table 4. Determinants of product quality that influence the choice of natural high-protein yoghurts, n=65

Determinants of product quality	Importance							
	Huge		Big		Average		Little	
	n	%	n	%	n	%	n	%
Price	16	24.6	31	47.7	16	24.6	2	3.1
Brand	6	9.2	18	27.7	22	33.8	19	29.2
Package size	4	6.2	33	50.8	22	33.8	6	9.2
Product composition	28	43.1	27	41.5	10	15.4	0.0	0.0
Taste	42	64.6	21	32.3	2	3.1	0.0	0.0
Expiry date	32	49.2	19	29.2	10	15.4	4	6.2
Promotion	13	20.0	23	35.4	15	23.1	14	21.5

Table 5. Five-point assessment of high-protein yoghurts

Food product	Sample designation	Sample number	Quality differentiator	IC	n	Average scores of examined yoghurts	Average scores of assessed attributes	SD	Me	$x_{\min} \div x_{\max}$
Natural skyr	A	802	Appearance	0.15	65	3.8	0.6	0.2	0.6	0.2÷0.8
			Colour	0.10	65	4.4	0.4	0.1	0.5	0.1÷0.5
			Fragrance	0.25	65	3.9	1.0	0.3	1.0	0.3÷1.3
			Texture	0.15	65	4.2	0.6	0.2	0.8	0.2÷0.8
			Taste	0.35	65	3.7	1.3	0.4	1.3	0.4÷1.8
			Total points	1	65	4.0	3.9	4	4.2	1.2÷5.2
Natural yoghurt, high protein	B	112	Appearance	0.15	65	4.1	0.6	0.1	0.6	0.3÷0.8
			Colour	0.10	65	4.0	0.4	0.1	0.4	0.1÷0.5
			Fragrance	0.25	65	3.4	0.8	0.3	1.0	0.3÷1.3
			Texture	0.15	65	4.1	0.6	0.1	0.6	0.2÷0.8
			Taste	0.35	65	3.1	1.1	0.4	1.1	0.4÷1.8
			Total points	1	65	3.7	3.5	3.7	3.7	1.3÷5.2
Natural skyr, Icelandic yoghurt	C	100	Appearance	0.15	65	3.9	0.6	0.2	0.6	0.2÷0.8
			Colour	0.10	65	4.4	0.4	0.1	0.5	0.2÷0.5
			Fragrance	0.25	65	4.1	1.0	0.2	1.0	0.3÷1.3
			Texture	0.15	65	4.2	0.6	0.2	0.8	0.3÷0.8
			Taste	0.35	65	3.7	1.3	0.4	1.4	0.4÷1.8
			Total points	1	65	4.1	3.9	4.1	4.3	1.4÷5.2
Vegan alternative	D	355	Appearance	0.15	65	3.9	0.6	0.2	0.6	0.2÷0.8
			Colour	0.10	65	2.8	0.3	0.1	0.3	0.1÷0.5
			Fragrance	0.25	65	2.8	0.7	0.3	0.8	0.3÷1.3
			Texture	0.15	65	3.7	0.6	0.2	0.6	0.2÷0.8
			Taste	0.35	65	2.6	0.9	0.5	0.7	0.4÷1.8
			Total points	1	65	3.2	3.1	3.2	3.0	1.2÷5.2
Natural yoghurt of the Icelandic type	E	400	Appearance	0.15	65	4.2	0.6	0.2	0.8	0.2÷0.8
			Colour	0.10	65	4.3	0.4	0.1	0.5	0.1÷0.5
			Fragrance	0.25	65	3.8	1.0	0.3	1.0	0.3÷1.3
			Texture	0.15	65	4.0	0.6	0.2	0.6	0.2÷0.8
			Taste	0.35	65	3.6	1.3	0.4	1.4	0.4÷1.8
			Total points	1	65	4.0	3.9	1.2	4.3	1.2÷5.2

Natural skyr	F	526	Appearance	0.15	65	3.4	0.5	0.2	0.6	0.2÷0.8
			Colour	0.10	65	4.3	0.4	0.1	0.4	0.1÷0.5
			Fragrance	0.25	65	3.7	0.9	0.2	1.0	0.3÷1.3
			Texture	0.15	65	3.8	0.6	0.2	0.6	0.2÷0.8
			Taste	0.35	65	3.8	1.3	0.4	1.4	0.4÷1.8
			Total points	1	65	3.8	3.7	3.8	4.0	1.2÷5.2
Natural yoghurt, high protein, 0% fat, lactose free	G	600	Appearance	0.15	65	3.7	0.5	0.2	0.6	0.2÷0.8
			Colour	0.10	65	4.4	0.4	0.1	0.5	0.1÷0.5
			Fragrance	0.25	65	3.7	0.9	0.3	1.0	0.3÷1.3
			Texture	0.15	65	3.9	0.6	0.2	0.6	0.2÷0.8
			Taste	0.35	65	3.8	1.3	0.4	1.4	0.4÷1.8
			Total points	1	65	3.9	3.7	3.9	4.1	1.2÷5.2
Natural protein yoghurt	H	222	Appearance	0.15	65	3.8	0.6	0.2	0.6	0.2÷0.8
			Colour	0.10	65	4.5	0.4	0.1	0.5	0.2÷0.5
			Fragrance	0.25	65	3.8	0.9	0.3	1.0	0.3÷1.3
			Texture	0.15	65	4.0	0.6	0.2	0.6	0.2÷0.8
			Taste	0.35	65	3.6	1.3	0.4	1.4	0.4÷1.8
			Total points	1	65	3.9	3.8	3.9	4.1	1.3÷5.2

IC – Importance Coefficient; SD – standard deviation; n – the number of the sample population; Me – the median symbol; $x_{min}÷x_{max}$ – minimum value÷maximum value

had tried products from the companies ‘H’ (87.7%), ‘G’ (84.6%), ‘D’ (72.3%) and ‘F’ (69.2%) least frequently. A comparable number of respondents had not tried or had tried ‘E’ yoghurt, 52.3% and 47.7% respectively, and ‘B’, 46.2% and 53.8% accordingly.

When asked about the availability of the analysed products in the store, respondents reported that ‘A’, ‘C’ and ‘B’ were the most accessible products, (98.5%), (92.3%) and (75.4%) respectively. The highest percentage of respondents (52.3%) advocated that ‘G’ is not a generally available product in stores.

Sensory evaluation of natural high-protein yoghurts

The results of the sensory evaluation obtained due to the five-point method revealed that the people participating in the research study rated natural, Icelandic yoghurt ‘A’ with the highest score, followed by natural skyr ‘C’ and natural, Icelandic yoghurt ‘E’ (Me=4.3) (Table 5). Of all the yoghurts evaluated, vegetarian alternative ‘D’, received the lowest number of points awarded by respondents (Me=3.0).

DISCUSSION

There has been a significant increase in consumer interest in protein-enhanced dairy products over recent years. This phenomenon represents a trend of sorts that responds to the growing public awareness and demand for products that support a healthy diet [18].

Natural high-protein yoghurts are increasingly becoming an integral part of the diets of physically

active people, athletes, and those who care about a healthy and balanced diet. The nutrients and minerals included in the composition of high-protein products support recovery and rebuilding processes in the body, as well as contribute to better control of body weight [18, 19].

Consumption of high-protein natural yoghurts ‘several times a week’, was declared by 40.0% of non-working students and 30.0% of students undertaking additional employment. In a research study conducted by Grębowiec and Korytkowska [20], 33.0% of respondents ingested dairy products ‘several times a day’, 29.0% of respondents declared that they consume yoghurts ‘several times a week’, while 27.0% of respondents chose the answer ‘once a day’.

The most frequently chosen natural yoghurt among non-working students was ‘A’ (48.6%), which has no fat (0 g/100 g) and low sugar content (4.1 g/100 g). In contrast, employed students preferred natural yoghurt of brand ‘B’ (33.3%), characterised by a slightly higher level of fat (0.3 g/100 g) and sugar (6.6 g/100 g). The choice of the following protein yoghurts may be determined by students of dietetics who favour products with reduced fat content and those that are easily available in popular discount retailers. A study concerning the consumer evaluation of the attractiveness of yoghurts conducted by Dykiel et al. [21] revealed that the most preferred yoghurts are fruit yoghurts, with strawberry yoghurt being the most popular (52.7%). Natural yoghurts were favoured by only 25.3% of respondents.

Traditional fruit yoghurts can contain even as much as 12.5 g/100 g sugar and added glucose-fructose syrup. A study by Chollet et al. [22] proved that attempts to reduce the sugar content, which negatively affects the human body, are needed, but on the condition that the sweetness is acceptable to the consumer. Flavoured yoghurt with 10.0% added sugar was described as too sweet compared to yoghurt with 7.0% added sugar, moreover, the treatment of increasing coffee or strawberry flavours did not contribute to pushing the preference for reduced sugar levels in the product. The study provides a guideline for manufacturers to reduce the amount of added sugar in their products to an acceptable level for consumers, while utilising flavours prudently.

In a study conducted by Grębowiec and Korytkowska [20], the most common reasons for consuming dairy products included the responses 'suitable for direct consumption' (44.0%) and 'force of habit' (42.0%). In the self-reported research, 72.0% of respondents chose natural high-protein yoghurts due to 'positive health and nutritional benefits', while 17.0% of participants indicated the answer 'for taste'. With regard to the taste of the yoghurt, the students demonstrated diverse preferences, as natural taste was preferred by 38.5% of the respondents, fruit flavour by 36.9% and non-fruit flavour by 20.0% of the respondents.

Within the sample group, the most preferred texture of yoghurt is traditional, that is, to be consumed with a spoon – 53.8% and dense – 29.2%. A different preference was shown by a group of respondents in a study conducted by Kowalczyk and Szymanski [23], where the most frequently consumed types of yoghurt included flavoured drinking yoghurts (52.6%) and natural Greek-type yoghurts (43.6%).

According to the most recent *Retail* report (2023/2024, SpicyMobile Magazine) [24], for the Polish population, price (46.0%) and promotion (19.0%) are the most important factors when choosing a product, while product opinion (12.0%) and brand (9.0%) are not as relevant for consumers in their purchasing decisions. In the self-report research study, the largest number of people were guided by the taste of the product (64.6%), the expiry date (49.2%) and the price (24.6%). Similarly, as proven in the report, brand was not important to consumers (29.2%).

In Gutkowska's article [25], the authors emphasise that nowadays consumers pay the highest attention to the state of their health, so the decisions they make when making purchases largely determine physical and mental well-being. Moreover, convenience is also of utmost importance, allowing quick shopping and easy access to products. For some consumers, the concepts of ecology and local products also seem to be significant. According to the analysis of the responses,

the author's survey, as many as 92.3% of respondents choose supermarkets/discount retailers as the place in which to buy natural high-protein yoghurt. It reinforces the belief regarding the convenience of shopping.

In the subsequent part of the conducted research study, the students of dietetics performed a consumer sensory evaluation of the high-protein yoghurts. The overall evaluation of the products included individual quality characteristics such as colour, fragrance, taste, texture and appearance, which were essential for the overall assessment of product quality. In a self-study, the results obtained using the five-point method revealed that high-protein yoghurts from the companies 'A', 'C' and 'E' received the highest scores, while the vegan alternative 'D' gained the lowest rating by the students of dietetics. Natural high-protein yoghurts of the brand 'A' and 'C' contained no fat in their composition (0.0 g/100 g of product), 'E' yoghurt had 2.0 g/100 g of fat, while plant-based alternative was characterised by a high fat content (3.3 g/100 g of product). In a study by Wichrowska and Wojdyła [26], yoghurts with a high fat content (above 3.0%) were characterised by the best organoleptic qualities, including taste, colour, fragrance, texture and appearance. Yoghurts with a low lactic acid content (less than 0.936%) and an excessively high content (more than 1.0%), however, were evaluated organoleptically worse compared to the others. Furthermore, it was demonstrated that refrigerated storage of yoghurt slightly deteriorated the colour, taste and fragrance of the yoghurts and had a greater effect on their texture and appearance, especially for yoghurts with lower fat content.

The research has shown that consumer acceptance of high-protein yoghurts depends on their diversified composition, which influences consumers' perceptions of specific product quality attributes. The palatability of high-protein yoghurts may significantly differ from the preferences and eating habits of people who do not consume such products. The results of the conducted research study predominantly depend on the individual preferences of the participants.

Limitations of the study

The study has several important limitations that need to be considered when interpreting the results. It was conducted with a small sample of 65 dietetics students, which limits the generalizability of the results to a broader population. The specific profile of the study group, consisting solely of students in this field of study, may influence the results due to their expertise and interests in nutrition. In addition, the survey was local in nature, covering students from one university in Poland, which does not allow for regional differences in consumer preferences.

Although a five-point sensory evaluation scale was used, the results obtained may reflect the subjective

opinions of the participants. The assessment of product availability was based on respondents' experiences, which could introduce error due to differences in local store offerings.

In addition, the survey was cross-sectional, which makes it impossible to analyze changes in consumer preferences over time or to assess their reactions to new products appearing on the market. Eliminating the above limitations, would produce more representative and comprehensive results in future surveys.

The benefit to recipients of the manuscript

For an audience including students of dietetics and food manufacturers, the manuscript provides information on current trends and consumer expectations regarding protein products. The research study may act as a guide to the high-protein yoghurt market, assisting dietitians in selecting and recommending the highest quality products. For manufacturers, this report can be crucial in improving products, adjusting them to consumer preferences and increasing their market competitiveness.

CONCLUSIONS

1. Consumer evaluation of selected brands of high-protein yoghurts, conducted with a five-point method, revealed that yoghurts from companies 'A', 'C' and 'E' were rated highest in terms of taste and texture. Meanwhile, the plant-based alternative from company 'D' received the lowest marks awarded by the students of dietetics.
2. The majority of respondents identified taste as a key factor influencing their purchase decisions, suggesting that taste preference plays an important role in the re-purchase of high-protein natural yoghurts.
3. Natural high-protein yoghurts of the 'A', 'C' and 'B' brands were rated as readily available on the market, which facilitates their purchase by consumers looking for this type of product.
4. The most popular yoghurts among non-working students are brand 'A', consumed several times a week, which may be due to their favourable nutritional values and low fat content. Conversely, students undertaking employment are most likely to reach for 'B' brand products, which are consumed daily. These preferences may reflect differences in lifestyle and perceptions of product availability as well as product quality depending on professional activity.
5. The most numerous group of respondents expressed their willingness to re-purchase natural high-protein yoghurt from company 'A'. In contrast, products from brands 'D' and 'F' were least

popular, which may be due to differences in taste preferences or availability of these products.

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Conflict of interest

The authors declare that they have no conflicts of interest concerning this article.

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