

POLISH CONSUMERS' PERCEPTION OF PLANT-BASED ALTERNATIVES

Marta SAJDAKOWSKA✉, Jerzy GĘBSKI, Marzena JEŻEWSKA-ZYCHOWICZ,
Krystyna GUTKOWSKA, Małgorzata KOSICKA-GĘBSKA

Warsaw University of Life Sciences – SGGW, Poland

Abstract: The study aimed to diagnose to what extent consumers know and consume plant-based alternatives and how they perceive them. The study was carried out on a nationwide sample of adult Poles ($N = 1003$) between June and September 2023. The CAWI method was used to collect data (Computer Assisted Web Interview). The results of our research indicate that the main association for meat alternatives was “soy products”, while for milk alternatives, it was “plant-based drinks”. At the same time, the analysis of the results of our research has shown that meat and milk alternatives belong to a group of products that can be considered rather unrecognizable by Polish consumers and have less positive associations. Among the recommendations for producers and processors of this category of food, it is worth pointing out that – along with the growing offer of alternatives – multi-channel communication with consumers should be used. This communication should be addressed in two ways: (1) to all consumers to interest them in this category of products and (2) to potential customers who know or are intentionally looking for meat and milk alternatives.

Key words: plant-based alternatives/substitutes, consumers, perception

INTRODUCTION

Meat and meat products play an important role in the diet because they are a good source of many nutrients needed for the proper functioning of the body [1]. However, their excessive consumption may contribute to the development of some diseases [2, 3]. While the consumption of foods of animal origin (e.g., red and processed meat) has been linked to harmful health effects, the health benefits of plant-based diets such as legumes, whole grains, nuts, vegetables, and fruits have been proven and described in the scientific literature [4, 5]. Dietary recommendations and greater awareness of the risks resulting from intensive animal production mean that consumers' eating habits are changing, with more and more people deciding to limit animal products in favor of plant-based foods [6]. Moreover, the food industry's selection of plant-based meat substitutes is becoming more and more popular [7, 8]. Nevertheless, insufficient knowledge of these products and their lower sensory

✉ Marta Sajdakowska – Department of Food Market and Consumer Research, Institute of Human Nutrition Sciences, 02-787 Warszawa, 159C Nowoursynowska St.; e-mail: marta_sajdakowska@sggw.edu.pl; <https://orcid.org/0000-0001-9635-5719>

Jerzy Gębski – Department of Food Market and Consumer Research, Institute of Human Nutrition Sciences, 02-787 Warszawa, 159C Nowoursynowska St.; jerzy_gebski@sggw.edu.pl; <https://orcid.org/0000-0002-5137-2344>

Marzena Jeżewska-Zychowicz – Department of Food Market and Consumer Research, Institute of Human Nutrition Sciences, 02-787 Warszawa, 159C Nowoursynowska St.; marzena_jezewska_zychowicz@sggw.edu.pl; <https://orcid.org/0000-0002-4140-4824>

Krystyna Gutkowska – krystyna_gutkowska@sggw.edu.pl; <https://orcid.org/0000-0002-0873-8478>

Małgorzata Kosicka-Gębska Department of Food Market and Consumer Research, Institute of Human Nutrition Sciences, 02-787 Warszawa, 159C Nowoursynowska St.; malgorzata_kosicka_gebska@sggw.edu.pl; <https://orcid.org/0000-0002-2043-7627>

attractiveness compared to meat may be a barrier to consuming plant-based alternatives [8, 9]. On the other hand, over recent decades, there has been a growing trend to promote healthy eating based on unprocessed, plant-based foods and organic products [10]. Consumers purchase plant-based meat substitutes for many reasons, including health problems, e.g., increased levels of certain cholesterol fractions in the blood, lifestyle changes towards veganism, and growing ethical concerns related to animal welfare [11]. Due to the above, the meat substitutes market has a growing trend, i.e., more and more categories of substitutes for animal products, as well as fish and seafood substitutes, appear on the market [12]. There is also growth in the market for milk substitutes and plant-based milk products [11, 13]. The studies carried out so far have assessed, among others, the share of food of plant origin in the diet, including plant-based substitutes for food of animal origin [14], while both the perception of this food category [15, 16, 17], as well as consumer expectations in this regard, still require recognition [7, 18].

Due to the increasing availability of plant-based substitutes on the market and the need to know what consumers' perception is about this category of products, the study aimed to diagnose to what extent consumers know and consume plant-based alternatives and how they perceive them.

MATERIAL AND METHODS

The study was carried out on a nationwide sample of adult Poles ($N = 1003$) between June and September 2023. The inclusion criteria for the sample included gender, age (18–83), and level of education. The CAWI method (Computer Assisted Web Interview) was used to collect data.

For this study, open-ended questions were used regarding the perception of animal products. The respondents were asked to indicate the associations that come to mind when they hear “plant-based meat substitute” and “plant-based milk substitute”. Then, the respondents were asked whether they knew and/or consumed any plant-based substitutes for animal products. The respondents could choose one of the following answers: (1) I don't know of them (I'm not familiar with them), (2) I know of them (I'm familiar with them), but I have never consumed them, and (3) I consume them. Before starting the statistical analysis, the answers obtained in the open questions were categorized. Table 1 presents associations concerning meat and milk alternatives.

Table 1. Associations regarding meat and milk alternatives (% , N).

Associations relating to meat alternatives	
negative evaluation (e.g., “nothing good”)	17.2 (173)
I don't know of them/no answer	16.6 (166)
soy products	11.8 (118)
other	10.2 (102)
Plant-based products (e.g., plant-based sausages, burgers, etc.)	9.8 (98)
positive evaluation (“similar”/“meat-like”)	9.4 (94)
“tasteless”/distasteful	5.8 (58)
Associations relating to milk alternatives	
I don't know of them/no answer	32.7 (328)
plant-based drinks	22.8 (229)
negative evaluation (e.g., “nothing good”)	18.7 (188)
other	10.1 (101)
soy	5.0 (50)

N – number of respondents.

The analysis used the chi-square test to confirm differences in associations regarding plant-based substitutes for meat and milk, taking into account their knowledge and/or consumption. Differences were assumed to be significant at $p < 0.05$. In a further stage of data analysis, data mining analysis using general CHAID (Chi-Squared Automatic Interaction Detection) models was used to identify associations that are related to the knowledge and/or consumption of plant-based substitutes. To classify the dependent variable, two groups of classification variables were used (associations regarding meat substitutes and associations regarding milk substitutes). Two models were performed, and the distribution of the dependent variable is presented in Table 2.

Table 2. Distribution of the dependent variable regarding knowledge and/or consumption of alternatives (% , *N*)

Statements referring to knowledge and/or consumption of alternatives	%	<i>N</i>
I don't know of them (I'm not familiar with them)	33.9	340
I know of them but, I do not consume them (I'm familiar with them, but I do not consume them)	27.8	279
I consume them	38.3	384

N – number of respondents.

Associations that were declared by respondents at least 50 times were used as classification variables in the models. The models also used the variable “gender” because it was assumed that women in the household are responsible to a greater extent for purchasing decisions on the food market and are characterized by taking greater care for health and, therefore, may be more interested in plant-based products than men [19, 20, 21]. The statistical analysis was carried out using the Statistica 13.3 statistical package [22, 23].

RESULTS AND DISCUSSION

Table 3 presents the sociodemographic characteristics of the study sample. The sample consisted of 1003 adults. About 70% of the surveyed people declared secondary and higher education, and 40% of people lived in cities with at least 100,000 inhabitants. People aged 18–44 constituted approximately 60% of the participants. Half of the people assessed their financial situation as quite good and very good (respectively: “We live frugally and have enough for everything” – 37.6% and “There is enough for everything without saving much” – 17.0%) (Table 3).

Table 3. Characteristics of the study sample (*N*, %)

		<i>N</i>	%
Gender	Male	483	48.2
	Female	520	51.8
Education level	Primary	100	10.0
	Vocational	180	18.0
	Secondary	403	40.2
Place of residence	Higher	320	31.8
	Village	377	37.5
	Towns up to 20,000 residents	139	13.9
	Towns with over 20,000 residents up to 100,000 residents	187	18.6
	Cities with over 100,000 residents up to 200,000 residents	104	10.4
Age	Cities with over 200,000 residents up to 500,000 residents	93	9.3
	Cities with over 500,000 residents	103	10.3
	18–24 years	104	10.4
	25–34 years	193	19.2
	35–44 years	205	20.4
	45–54 years	162	16.2
	55–64 years	221	22.0
Subjective assessment of their financial situation	over 64 years	118	11.8
	There is enough for everything without saving much	170	17.0
	We live frugally and we have enough for everything	377	37.6
	We live very frugally to save for major purchases	269	26.7
	There is only enough money for the cheapest food and clothing	88	8.8
	There is only enough money for the cheapest food, and not enough for clothes	41	4.1
	There is not enough money even for the cheapest food and clothing	13	1.3
I don't know/It's hard to say	45	4.5	

N – number of respondents.

The analysis of the collected data presented in Table 4 showed that the three most common associations relating to plant-based meat substitutes included the following: associations negatively describing the substitutes, e.g., “nothing good” (number of indications – 173) and “soy products” (118), and in addition, 166 people indicated the answer “I don’t know/I have no opinion”. Among people who declared that they had negative associations with plant-based meat substitutes, the largest share (39.3%) were people who declared that they knew of these products but did not consume them. In the case of people who were unable to provide any association, the largest percentage (58.4%) were people who declared knowledge of these products. Among people who associated plant-based meat substitutes with soy products, the majority of respondents (59.3%) declared that they consumed this category of products. Research by other authors indicates that regarding plant-based substitutes, the respondents’ associations were mainly related to taste, perceived protein content, satiety, and domestic origin [24].

Table 4. Associations regarding meat and milk alternatives, taking into account the declared knowledge and/or consumption (%), *N*)

Associations relating to meat and milk alternatives	Declaration of knowledge and/or consumption				<i>p</i> -value	
	I don't know of them (I'm not familiar with), <i>N</i> = 340	I know of them (I'm familiar with), but I have never consumed them; <i>N</i> = 279	I consume <i>N</i> = 384	Total <i>N</i> = 1003		
Plant-based meat alternatives						
Negative evaluation (e.g., “nothing good”)	association	36.4 (63)	39.3 (68)	24.3 (42)	100.0 (173)	<.0001
	no association	33.4 (277)	25.4 (211)	41.2 (342)	100.0 (830)	
Soy products	association	15.3 (18)	25.4 (30)	59.3 (70)	100.0 (118)	<.0001
	no association	36.4 (322)	28.1 (249)	35.5 (314)	100.0 (885)	
I don't know/No answer	association	58.4 (97)	22.9 (38)	18.7 (31)	100.0 (166)	<.0001
	no association	29.0 (243)	28.8 (241)	42.2 (353)	100.0 (837)	
Plant-based milk alternatives						
Plant-based drinks	association	14.0 (32)	26.6 (61)	59.4 (136)	100.0 (229)	<.0001
	no association	39.8 (308)	28.2 (218)	32.0 (248)	100.0 (774)	
Negative evaluation (e.g., “nothing good”)	association	45.7 (86)	33.0 (62)	21.3 (40)	100.0 (188)	<.0001
	no association	31.2 (254)	26.6 (217)	42.2 (344)	100.0 (815)	
I don't know/No answer	association	48.8 (160)	29.9 (95)	22.3 (73)	100.0 (328)	<.0001
	no association	26.6 (180)	27.3 (184)	46.1 (311)	100.0 (675)	

N – number of respondents.

As many as 328 people did not indicate any association with plant-based milk substitutes (I don’t know/I have no opinion), while these products were associated with plant-based drinks by 229 people and described negatively (e.g., “nothing good”) by 188 people. Among those declaring no opinion, almost half (48.8%) of the respondents were people declaring that they did not know this category of products. Among the respondents who associated plant-based milk substitutes mainly with plant-based drinks, the majority (59.4%) declared that they consumed them. However, in the group negatively describing substitutes, 45.7% were people who did not know of these products, and 33.0% were people who knew of these products but did not consume them. Research by other authors indicates that among the associations regarding plant-based milk substitutes and products, the most common positive ones included associations related to, among others, suitability for people who are lactose intolerant. However, the negative association terms were referring to, among others, nutritional value, unnatural character, and price [25].

The results regarding associations related to plant-based meat substitutes obtained using the decision tree are presented in Figure 1. The first classification criterion for a given sample (ID1) was the lack of any association – “I don’t know/no answer” (ID3). Among people who declared no opinion, the largest share was mainly people who did not know of these products (58.4%); however, only 18.7% consumed them. This node is the determination node, i.e., it is not subject to further division. The remaining people (83.4%) with associations regarding plant-based meat substitutes (ID2) are mainly people consuming these products (42.2%); those who knew but did not consume these products constituted 28.8%, and those who did not know of these products was 29.0%. This node was further divided by the variable “negative assessment” – “nothing good”. Those who expressed this opinion (ID5) constituted 8.6% of the shared variable, and the vast majority of them (77.27%) were people who did not consume substitutes (43.9% – I do not know of them, and 33.3% – I know of them but do not consume them).

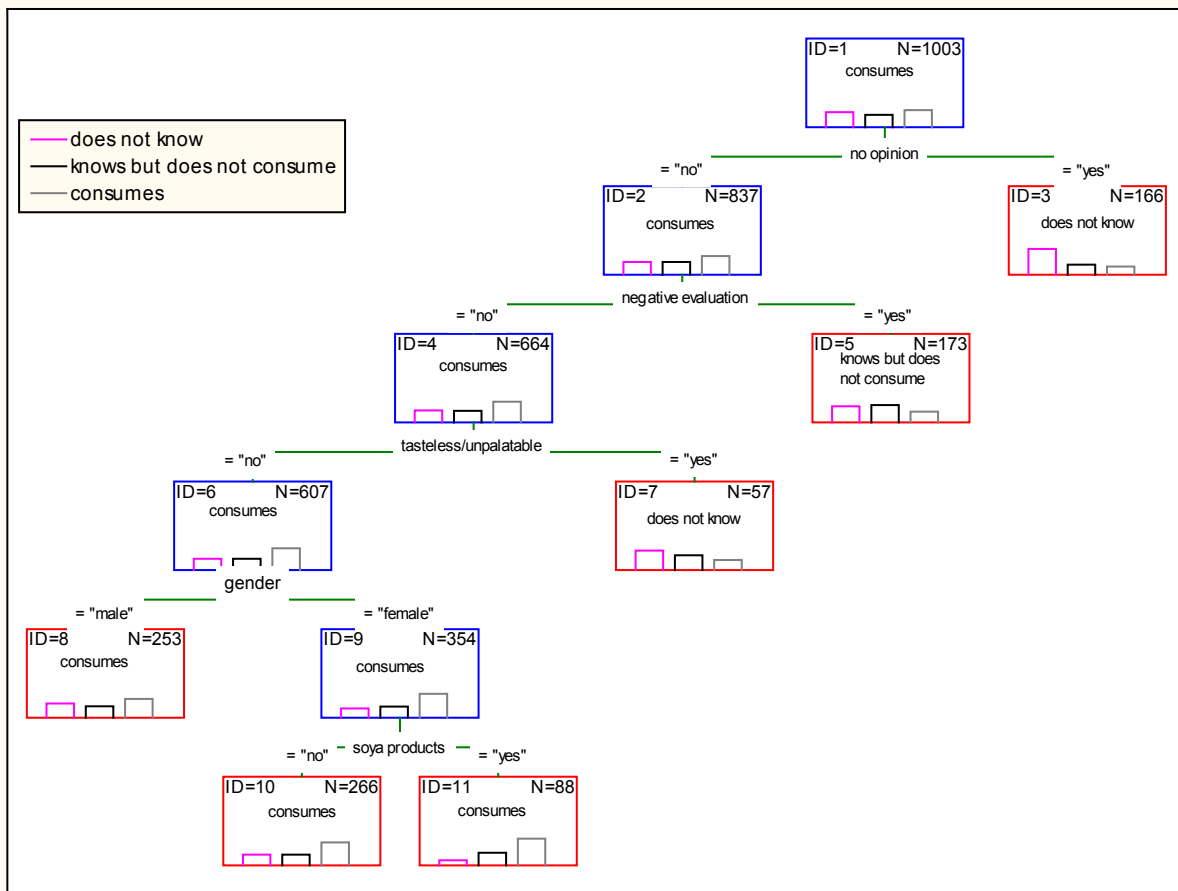


Figure 1. Graphical representation of the CHAID model referring to plant-based meat

Respondents who did not express a negative opinion about plant-based meat substitutes (ID4) constituted 79.3% (of them – 46.8% consumed these products). This node was further divided by the “tasteless/unpalatable” variable. People who expressed such an opinion (ID7) constituted 8.6%, of whom 43.9% did not know of them, and 33.3% knew of them but did not consume them. The second node is people who do not share this opinion (ID6), constituting 91.4% of respondents, of whom almost half (49.1%) consume substitutes, while 25.5% did not know of them, and 25.4% knew of them but did not consume them. This node was further divided by the gender variable. A male node (ID8) was separated, which became the determination node in which the largest share (42.3%) was people consuming meat substitutes. There were 32.0% who did not know of them and 25.7% who knew of them but did not consume them. In node ID9, 54.0% of respondents consumed substitutes. This node was then split into 2 end nodes by the variable “soy products”. People who declared such an association (ID11) constituted 24.0%, and among them, as many as 60.2% of people consumed substitutes. It was similar in the second node from this division (ID10), which accounted for 75.0%, and in it, over half (51.2%) were consumers who declared the consumption of meat substitutes.

The lack of interest in plant-based substitutes for meat products among people participating in our study was caused by two factors: lack of knowledge about them and reluctance to eat them; they have similar percentages among respondents. In the case of meat substitutes, gender did not significantly differentiate preferences related to these products.

Research by other authors indicates that in recent years, many types of alternative products to those of animal origin have appeared on the market, containing, e.g., cereals, legumes, or mushrooms as a source of protein [16], and the main barriers to the consumption of meat alternatives have been defined as ignorance and lower sensory attractiveness of plant-based products compared to meat [9]. Other factors hindering the transition to vegetarian and vegan diets include concerns about the taste, price, and convenience of plant-based foods [26]. Consumers' concerns may also be related to the fact that there is a false belief about the healthiness of these products because of their plant origin. Research shows that a great number of plant-based meat alternative products available in Spanish supermarkets have a variable nutritional composition depending on the product category [27]. Although

there is research showing that plant-based meat has a more favorable nutrient profile than its meat counterparts [28], other research also shows that when replacing red and processed meat with plant-based meat alternatives, caution should be taken to decrease the risk of deficiencies for some micronutrients [29]. Moreover, it was noted that for both people who are and are not consumers of substitutes for animal products, the ideal meat alternative should be cheaper, contain more protein and vitamins, and have a lower caloric value [16]. Other research made among consumers from Ireland shows that of those consumers who report eating plant-based meat alternatives, one-third reported that they select these products because of health, about 20% because of taste, and about 15% because of climate change [30].

The results regarding the associations related to plant-based milk substitutes obtained using the decision tree are presented in Figure 2. Regarding the associations related to milk substitutes, the first variable classifying the dependent variable was “plant-based drinks”. People who declared such associations (ID3) constituted 22.8% of the entire sample, and the majority of them (59.4%) were people consuming plant-based milk substitutes, and only 14.0% of them did not know of these products. This node was further split by “gender” into two determination nodes. The “male” node (ID6) included 31.0% of people, and among them, 57.7% consumed plant-based milk

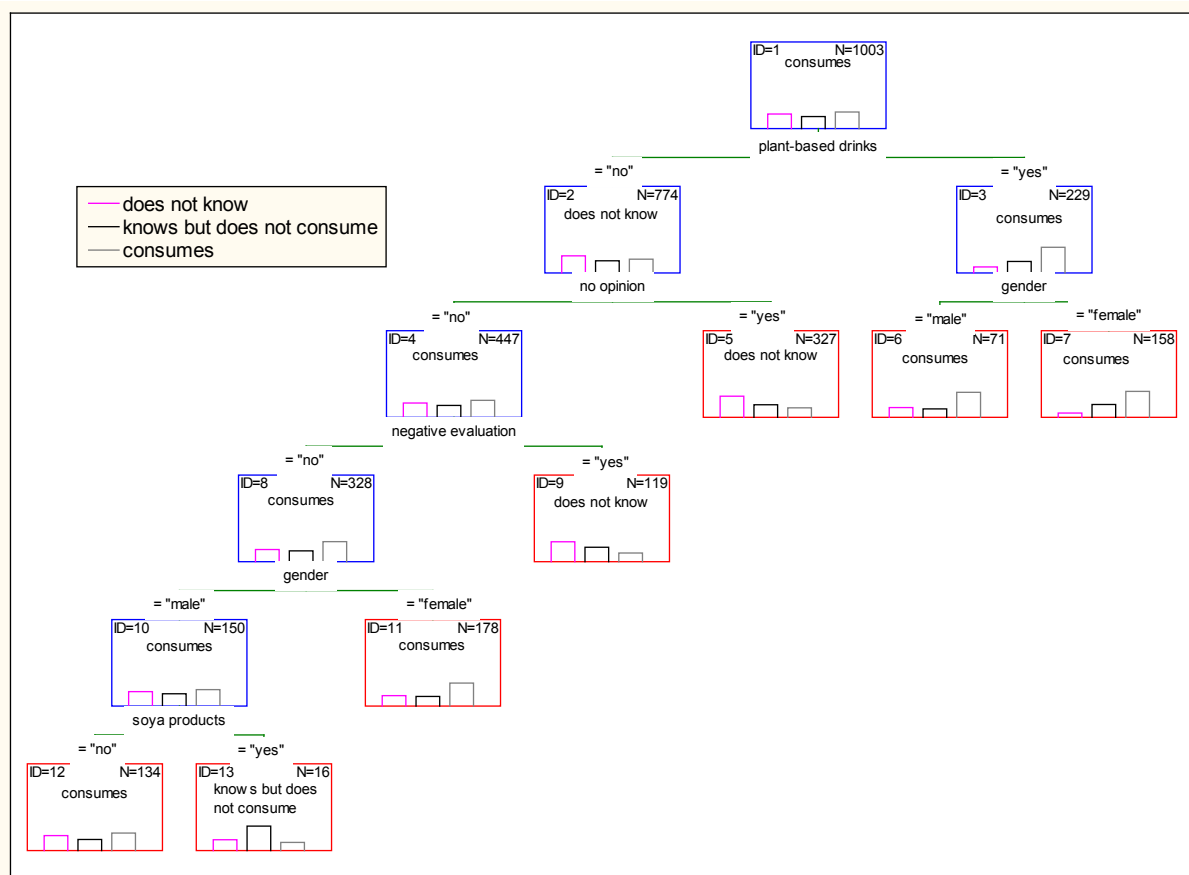


Figure 2. Graphical representation of the CHAID model referring to plant-based milk

substitutes. Among women (ID7) – 69.0%, the largest share was people consuming substitutes (60.0%), and 30.0% declared that they did not consume them. In the case of 77.2% of respondents who had no associations with plant-based drinks (ID4), people who did not know of these products dominated (39.8%), followed by people who knew of them but did not consume them (28.2%). This node was further divided by the variable “I don’t know/ /no answer”, in which 42.2% said yes (ID5), and among them, there were also mainly people who did not know of these alternatives (48.9%) and those who knew of them but did not consume them (29%). Among those who had an opinion on this subject (ID4; 57.8%), the division of the dependent variable was similar to that in the entire sample (with a small predominance of people consuming plant-based milk substitutes). This node was divided by the variable “negative evaluation” – “nothing good”). People who declared this opinion (ID9) constituted 26.6%, and the vast majority did not consume substitutes (46.2% did not know of them, and 33.6% knew of them but did not consume them). People who did not share this opinion (ID8) constituted 73.4% and formed a node in

which 46.3% of people consumed these substitutes. This node was further divided by the variable “gender”. In the determination node “female” (ID11), constituting 54.3%, it was dominated by people who consumed substitutes (53.4%). In the “male” node, there was a fairly even distribution of responses (33.3% did not know of them, 28.7% knew of them but did not consume them, and 38.0% consumed them). This node was eventually split into two end nodes by the “soy products” variable. People who associated plant-based milk substitutes with soy (ID13; 10.7%) did not consume this type of food (56.3%). People who do not declare associations with “soy products”, constituting 89.3%, mainly consume these types of products (40.3%) or do not know of them (34.3%).

In the case of plant-based milk substitutes, a situation similar to that of meat substitutes was reported. Not consuming substitutes results either from lack of knowledge (lack of experience with them) or aversion to them. Among people who did not declare a negative assessment of milk alternatives, women had a positive attitude toward consuming them, while men – who associated these products with soy – did not consume them.

Studies have shown that milk substitutes are popular among consumers, and therefore, a large number of plant-based milk alternatives have been introduced to the market in recent years – e.g., plant-based drinks, plant-based yogurt substitutes, and plant-based cheese substitutes [30]. However, as noted in our research, despite the growing offer of these products on the Polish market, they are not fully recognized by the respondents. The slightly greater interest in these products among women noted in our research is confirmed in other studies and may generally result from, among others, women’s greater care for their health, including paying more attention to appropriate nutrition [19, 20, 21].

CONCLUSIONS AND FUTURE PERSPECTIVES

The results of our research indicate that the main association for meat alternatives was “soy products”, while for milk alternatives, it was “plant-based drinks”. At the same time, it should be emphasized that the analysis of the results of our research has shown that meat and milk alternatives belong to a group of products that can be considered rather unrecognizable by Polish consumers and have rather less positive associations. Regarding milk alternatives, women were slightly more willing to declare that they consumed this category of products.

Among the recommendations for producers and processors of this food category, it is worth pointing out that – along with the growing offer of substitutes – multi-channel communication with consumers, including social media, should be used in parallel. Moreover, as market observation indicates, a significant part of those interested in limiting or completely giving up the consumption of animal products are rather young consumers. This communication should be addressed in two ways: (1) to all consumers to interest them in this product category and (2) to potential customers who know or are intentionally looking for meat and milk alternatives. It can also be assumed that popularizing the planetary diet, and even more broadly, sustainable consumption, may also increase consumer interest in consuming plant-based alternatives.

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