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Anna Rusek, Ewa Biazik, Tomasz Lesiów
Wrocław University of Economics
e-mails: aniamaria113@ten.pl; ewa.biazik@ue.wroc.pl; tomasz.lesiow@ue.wroc.pl

CONSUMER KNOWLEDGE AND OPINION ON SELECTED SWEETENERS USED IN FOOD. PART 2

WIEDZA I OPINIA KONSUMENTÓW NA TEMAT WYBRANYCH SUBSTANCJI SŁODZĄCYCH STOSOWANYCH W ŻYWNOŚCI. CZĘŚĆ 2

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Summary: There are a growing number of sugar substitutes either allowed in food production or available on the market. The wide range of these substances might make consumer purchasing decisions harder. Therefore, the aim of this study was to evaluate Polish consumer knowledge of, and preferences for, the natural and synthetic sweeteners available on the market. This study presents the results of a survey of 186 consumers from Poland concerning consumer knowledge and opinions towards the consumption of selected sweeteners. The study showed that the majority of Polish consumers had insufficient knowledge about the use of different types of sugar substitutes and education in this area should be provided. The majority of respondents are not able to connect the name of sweeteners with their corresponding E symbols and are not willing to broaden their knowledge in this area. Moreover, 53% of respondents stated that sweeteners had a negative influence on health, and only 55% of responders believed that legally approved sweeteners were safe. Respondents were critical towards the application of sweeteners and were open to a change of habits in that respect, especially if it had a beneficial influence on their health.

Keywords: sugar replacers, sweeteners, consumer knowledge and opinions

Streszczenie: Na polskim rynku istnieje wiele substancji zastępujących cukier, dopuszczonych do stosowania jako dodatek do żywności. Dlatego celem pracy była ocena wiedzy oraz opinii badanych konsumentów na temat substancji słodzących – zarówno tych możliwych do zakupu i samodzielnego dawkowania, jak i dodawanych przemysłowo do produktów spożywczych, a także wpływu tych substancji na zdrowie. Badanie wykazało, że większość polskich konsumentów miała niewystarczającą wiedzę na temat stosowania różnych rodzajów substytutów cukru. Większość respondentów nie jest w stanie połączyć nazwy substancji słodzących z odpowiadającymi im symbolami i nie deklarowała chęci pogłębiania swojej wiedzy w tym zakresie. Ponadto 53% respondentów stwierdziło, że słodziki mogą mieć negatywny wpływ na zdrowie. Ponad połowa respondentów (55%) uważa, że legalnie dopuszczone substancje słodzące są bezpieczne. Respondenci byli krytyczni wobec stosowania substancji słodzących oraz otwarci na zmianę zwyczajów pod tym względem, szczególnie jeśli wywarła korzystny wpływ na ich zdrowie.

Słowa kluczowe: zamienniki cukru, substancje słodzące, opinia konsumentów,

1. Introduction

Rusek et al. [2016] presented information about sweeteners, their categories and influence on human health, and their potential application in food production. Based on the results of a survey, we demonstrated which food products containing these substances are most likely to be purchased by Polish consumers. Also, the previous study shows which sweetening agents are used by respondents and what affects their purchasing decisions.

The aim of the study was to evaluate the knowledge and awareness of the use of sweeteners, both those that are purchased separately and those which are components of processed food products available on the market. This is an issue linked most closely to product safety.

We intended to prove that respondents' knowledge about sweeteners used in food production is low. Moreover, this can lead to inappropriate diet composition in terms of sugar intake by Polish consumers.

The study was prepared based on current literature studies and the results of a survey of 186 consumers from Poland.

2. Materials and methods

The study was conducted in September 2016. Questions included in the survey referred to consumers' knowledge, habits and opinions about sweeteners used in food. The questionnaire was distributed among employees of companies from different sectors of the economy, and students, teachers, pupils and parents in Wroclaw, Ostrów Wielkopolski and Wałbrzych. A previous study [Rusek et al. 2016] described the questionnaire's respondents. This previous paper also presented the respondents attitude to sweeteners available on the market and sweetened food products.

This paper discusses the level of consumer knowledge about sweeteners and analyses their opinions about their use. The survey was answered by 86 people, 124 women (67%) and 62 men (33%). The largest group of respondents was represented by people aged 45-60 (31%). The percentage of respondents belonging to the next three age groups i.e. "18-24", "25-34", "35-44" was similar (16-18%). In the 60+ group there were 12% of the questioned people, only 6% of the respondents were not adults.

Among the respondents, almost half (48%) declared they had completed higher education (master's degree), 37% of those questioned had finished secondary school or had a bachelor's degree (37%). The lowest percentage were respondents who had only completed primary school (7%). 55% of respondents declared a city of over 500 thousand as their place of residence. People living in a city from 100 thousand to 500 thousand inhabitants represented 12% of respondents and in a city to 100 thousand inhabitants 23%. The smallest group of respondents (11%) lived in a rural area.

In this study, five income categories were used. The highest number of respondents had incomes in the range from 1000 to 2000 PLN n (38%). A similar percentage of those questioned were on low (up to 1000 PLN) or medium (2000-3000 PLN) incomes. Only 11% of respondents earned 3000-4000 PLN. The last group of respondents (6%) were characterized as a high income group – above 4000 PLN.

Questions 1 and 2 were prepared to generate information about knowledge about sweeteners. In Question 1 we asked the respondents to indicate the sweeteners which they knew from a list of 18. The list was prepared on the basis of the origin of these substances (natural, synthetic, or semisynthetic [Miśkiewicz, Nebesny, Rosicka-Kaczmarek 2012]). In question 2, the respondents were asked to indicate proper symbols (E 967, E 951, E 960 [Nowicka, Wojdyło 2014]) to different types of food additives including sweeteners, colourants, emulsifiers / stabilizers and preservatives. The aim of this question was to determine consumer knowledge about the types and names of food additives. This question also checked if they were also able to distinguish between sweeteners and other food additives.

Questions 3 to 6 were close ended. The first two were single choice type, while the next two were multiple-choice with the possibility of adding respondents' own answers. These questions referred to knowledge about the effects of sweeteners on human health, the safety of sweeteners legally approved for use in food, and the benefits and threats from the use of sugar substitutes [Świąder, Waszkiewicz-Robak, Świderski 2011]. Respondents evaluated not only sugar but also its substitutes available on the market. There was also the possibility to give their own responses after selecting the answer "other".

The last three questions (from 7 to 9) summarize all the information obtained from those questioned. Each question (single choice) has 3 possible answers, one of which can be selected by respondents. They were asked whether they were interested in novel products acting as sweetening agents, what type of sweetener they preferred, i.e. natural or synthetic sweeteners instead of sugar, and whether they were able to change their eating habits in terms of sugar consumption.

It should be emphasied that the questions were structured in such a way that would enable people who do not use sweeteners to also be able to express their opinion. Depending on the question, there were options such as "do not eat", "do not use", etc. In addition, most of the multiple-choice questions included the answer "other" and a space to write down their own response.

3. Results and discussion

In question 1, respondents were asked to indicate the origin of the listed sweetening substances. More than half (54%) identified saccharin. Also, aspartame was well known by over half the respondents (52%). Knowledge of sugar syrups and xylitol was demonstrated by 44% and 35% of respondents, respectively. Further respondents enumerated: stevia (28%), sorbitol (23%), acesulfame (10%), cyclamate and

mannitol (both 8%), glycerin (5%), and miraculin (2%). Only around 1% of respondents identified neohesperidose, neotame, Yacon and Lou Han Guo. None of the respondents had heard of alitame. Moreover, 17% of the respondents had not heard of any of the sweeteners mentioned (Figure 1).

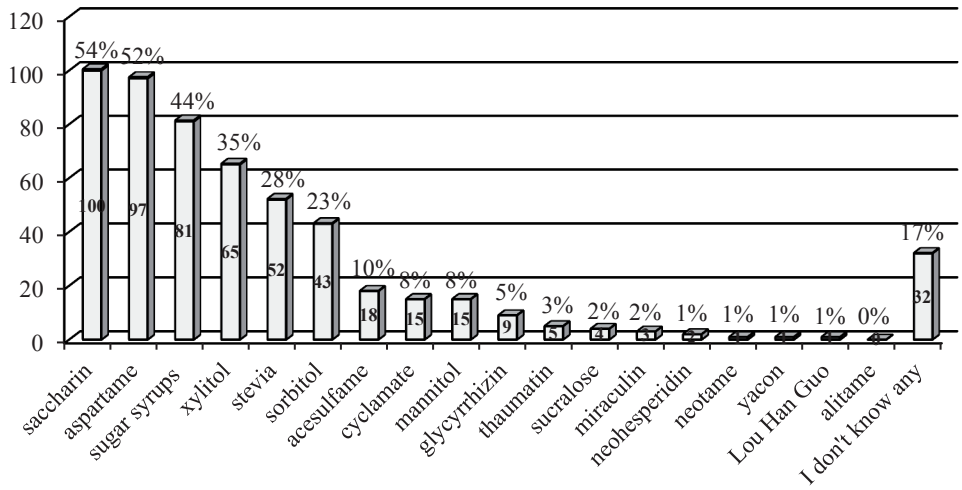

Fig. 1. Consumer knowledge about selected sweeteners available on the market
Rys. 1. Znajomość przez respondentów wybranych substancji słodzących dostępnych na rynku

Source: own data.
Źródło: opracowanie własne.

In the next question respondents were asked to assign three sweeteners among other food additives to the corresponding E symbols from the list of additives (not just sweeteners). The majority of the respondents (71%) were not able to recognise the listed E symbols (Figure 2). A small group of people were able to answer correctly: 9% of them assigned one sweetener to the correct symbol. 7% correctly identified the sweetening substances. Only 6% of the respondents were able to recognise E symbols for all three listed sweeteners. The last group of respondents (7%) were not able to identify sweeteners from other types of food additives.

In the following questions (from 3 to 6), we analysed consumer awareness of the influence of sweeteners on human health. More than half of the respondents (53%) stated that sweeteners may have a negative effect on human health (Figure 3). On the other hand, 36% did not consider there were any potential health effects from sweeteners. Only 4% of respondents stated that the impact of these substances may be both positive and negative, depending on the type and amount of sweetener consumed. A small number of respondents (7%) believed that the use of sweeteners had a positive impact on the health of consumers.

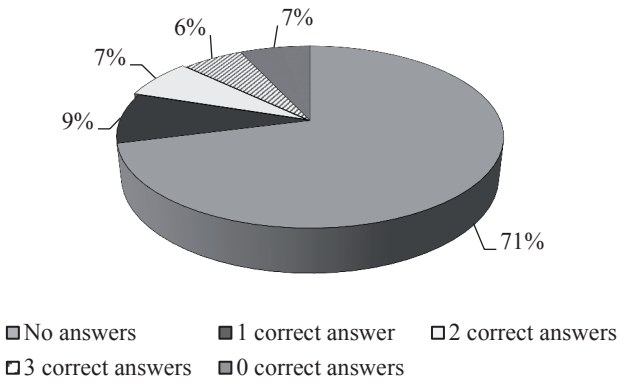

Fig. 2. Identification of the E symbols of food additives by consumers
Rys. 2. Wiedza respondentów na temat znajomości symboli E dodatków do żywności

Source: own data.
Źródło: opracowanie własne.

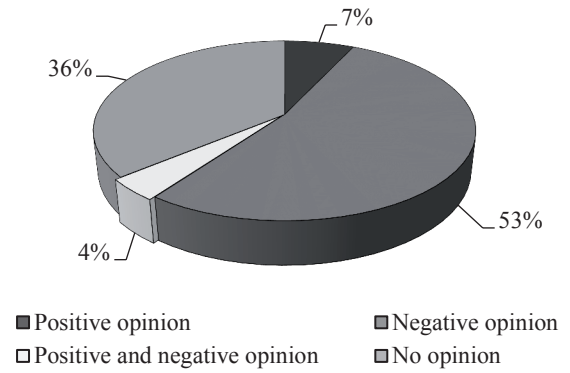

Fig. 3. Consumer opinion about the potential effects of sweeteners on health
Rys. 3. Opinie konsumentów na temat potencjalnego wpływu substancji słodzących na zdrowie

Source: own data.
Źródło: opracowanie własne.

The results were influenced by the respondents' place of residence (Figure 4). Only 5% of respondents in the group of people living in cities of up to 100 thousand inhabitants and cities with 100 to 500 thousand inhabitants stated the beneficial health aspects of sweeteners.

Figure 5 shows consumer opinion on the health safety of legally approved sweeteners. More than half of the respondents (54%) believed that only some sweeteners listed were safe for their health. In addition, 27% had no knowledge of whether these substances were safe or not. Other respondents (11%) believed that these substances were not safe, despite regulations. Only 6% of respondents stated that they believed that all products approved by government were safe for consumption.

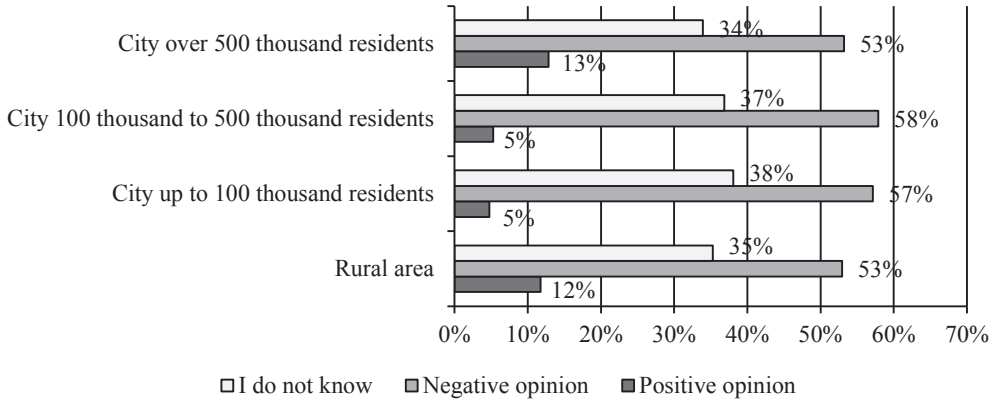

Fig. 4. Consumer opinion about the potential effects of sweeteners on health in relation to place of residence
Rys. 4. Zależność pomiędzy miejscem zamieszkania a opinia konsumentów na temat potencjalnego wpływu substancji słodzących na zdrowie

Source: own data.
Źródło: opracowanie własne.

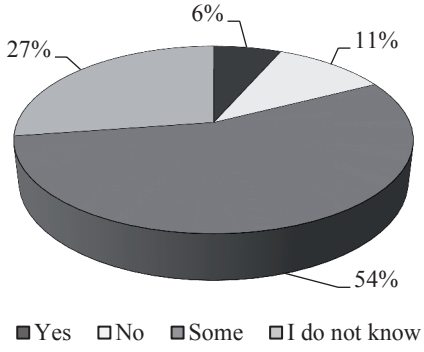

Fig. 5. Consumer opinion about the safety of legally approved sweeteners authorized for use in food production
Rys. 5. Opinie konsumentów na temat bezpieczeństwa dla zdrowia człowieka substancji słodzących dopuszczonych przez prawo do stosowania w żywności

Source: own data.
Źródło: opracowanie własne.

Consumer opinion about the safety of legally approved sweeteners was related to their level of education. 42 % of people with a basic education level (primary school) had no knowledge about the safety of sweetening food additives. In contrast, only 20% of respondents from the group of people educated to university level were not able to evaluate the safety of the listed substances. Only 3% of secondary school graduates believed that sweeteners approved by the government were safe (Figure 6).

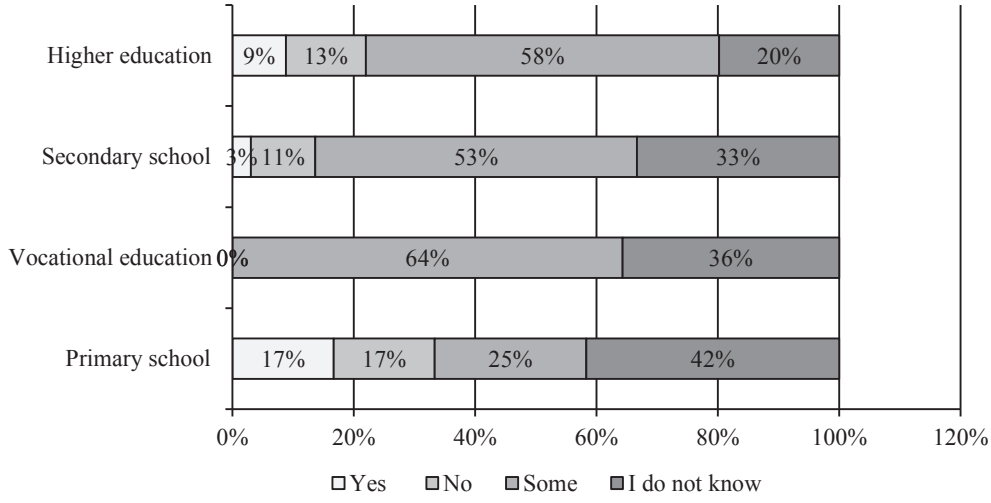

Fig. 6. Consumer opinion on the safety of legally authorized sweeteners authorized for food production in relation to respondents' level of education
Rys. 6. Zależność pomiędzy wykształceniem a opinią konsumentów na temat bezpieczeństwa dla zdrowia człowieka substancji słodzących dopuszczonych przez prawo do ich stosowania w żywności

Source: own data.
Źródło: opracowanie własne.

The next question referred to the positive effect of the use of sugar replacers. The respondents enumerated the following benefits: a taste similar to sucrose (48%); low calorific intake (36%); reduced energy value (30%); low glycemic index (25%); and anti-decay effects (17%). In contrast, 10% of the respondents did not answer. The other 3% of consumers mentioned other types of sugar substitutes.

The respondents also indicated the potential risks associated with the use of sweeteners and sugar substitutes such as, carcinogenic activity (44%); effect on weight and functioning of internal organs (28%); changes in the amount of secreted enzymes and their activity (24%); liver steatosis (14%); teratogenic, mutagenic and genotoxic effects (11%); and other (1%). On the other hand, 23% of respondents declared that they did not know what hazards could be caused by sugar substitutes.

In the last three questions (question 7-9), we asked whether the respondents were interested in the latest information on sweeteners and what type of sweeteners (natural or synthetic) they used in their diet and if they would be willing to change their eating habits. More than half of the respondents (54%) were not interested in information updates about sweeteners. Only 11% of people looked out for new information related to sweeteners.

More than half of the respondents (64%) stated that they would be able to stop using sugar and replace it with natural sweeteners. Around 20% of respondents were

not sure whether they would be able to limit sugar in their diet and 16% preferred sugar instead of natural sweeteners.

The last question referred to consumers changing their eating habits (Figure 7). Over 59% of respondents declared a willingness to change their eating habits, while 26% were not sure. Only 15% of respondents stated that they would not change their eating habits.

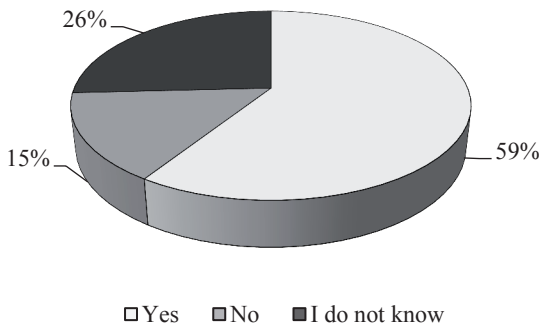

Fig. 7. Respondents' willingness to change their eating habits
Rys. 7. Skłonności respondentów do zmiany nawyków żywieniowych

Source: own data.
Źródło: opracowanie własne.

These results were related to the value of income per capita (Figure 8). Respondents who were most likely to introduce changes in their diet came from the groups where the income was 2000 to 3000 PLN (77%) and above 4000 PLN (64%). However, more than half of the respondents characterised by the lowest income and income in the range 1000-2000 PLN also declared their willingness to change their eating habits (51% and 54%, respectively). Most of the undecided consumers came from the group with incomes in the range from 3000 to 4000 PLN (32% of people from this group).

The addition of sweeteners to food raises many questions. More than half of the respondents believe that these substances may have a negative impact on human health (53%) or many have no knowledge or opinion (36%). Only a few Polish consumers (7%) believed in the positive effect of sweeteners. Many of the respondents (55%) were not interested in using sweeteners in food, because they believed that only some legally approved sweeteners were safe for human health. Almost half of the respondents (44%) also stated that these compounds may be a threat and show a negative effect on human health, for example, carcinogenic activity (44%).

These findings were also shown in a nationwide research project entitled "Level of consumer awareness in terms of threats occurring in food" conducted in 2003 [Ozimek et al. 2004]. This study presented the results of a survey of 1000 adult

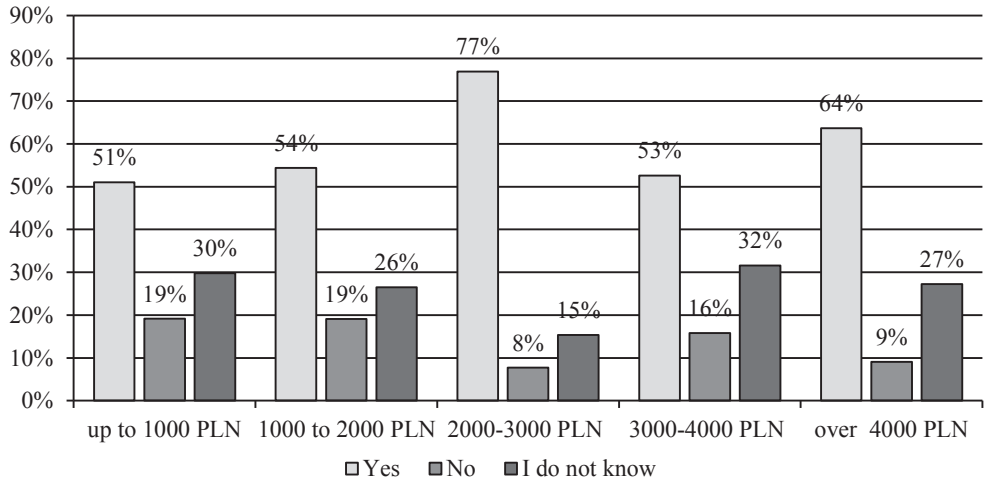

Fig. 8. Respondents' willingness to change their eating habits in relation to income per capita
Rys. 8. Charakterystyka skłonności respondentów do zmiany nawyków żywieniowych w zależności od dochodu przypadającego na 1 osobę w gospodarstwie domowym

Source: own data.
Źródło: opracowanie własne.

consumers. In spite of legal regulations which strictly define the terms and conditions of the use of additives in the food industry, a wide range of additives in food products may make consumers feel uneasy. These results were related to the age of the respondent . It was reported that the youngest group of consumers, i.e. people aged 18-24, were the least concerned about additives present in food products. Only 27% of people from this group stated that they were concerned about these substances. On the other hand, older respondents were less confident about using food additives. Over 35% of these declared that they had no trust in government assurances. Respondents with basic education levels were least concerned about food additives (33.2%) and the biggest doubts about food additives were noted for respondents with vocational education (43.6%). Respondents with the income at the level of 4000 PLN showed the least confidence in additives (27.8%). Those respondents with the lowest incomes were much more concerned about foods containing additives (41.5%) [Ozimek, Gutkowska, Żakowska-Biemans 2004].

Also, these tendencies were observed by Rusek et al. [2016]. The food safety of purchased food products is crucial for 27% of respondents. This declaration was stated by 32% of women and 18% of men. Almost identical results were obtained in different consumer groups divided according to age and material situation. The following results were observed for particular age groups: youngest – under 18 years old (17%), 18-24 years old (25%), 25-34 years old (21%), and older (60+) – 36%.

28% of respondents that declared a good financial status (income above 2000 PLN per household member) check the sweeteners which they buy in terms of safety.

Figure 9 shows the opinion of women and men about the safety of legally approved sweeteners. Only 15% of women and 6% of men do not trust any of the sweeteners recognized as safe for use in food. In addition, 56% of the women and 48% of the men think that only some of the sweeteners are safe. The risk of using sweeteners is most emphasized by people aged 25-34 (21%) and people over 60 (18%). Over 65% of respondents aged 25-34 stated that only selected approved sweeteners are safe. 17% of the youngest consumers stated that all sweeteners from the approved additive list are safe for human health. In contrast, 33% of them indicate the danger of selected sweeteners. These results were also influenced by consumers income. The greatest concern (23% of respondents) about the safety of all sweeteners was observed in the consumers' group with a good financial situation (income above 2000 PLN per householder). In the group with low income (below 1000 PLN), only 4% were uncertain of using sweeteners and in the group income in the range 1000 -2000 PLN – 8% respectively. According to 56% of respondents with an average financial situation and 48% of respondents with a low financial situation, some sweeteners raise concern about the human health.

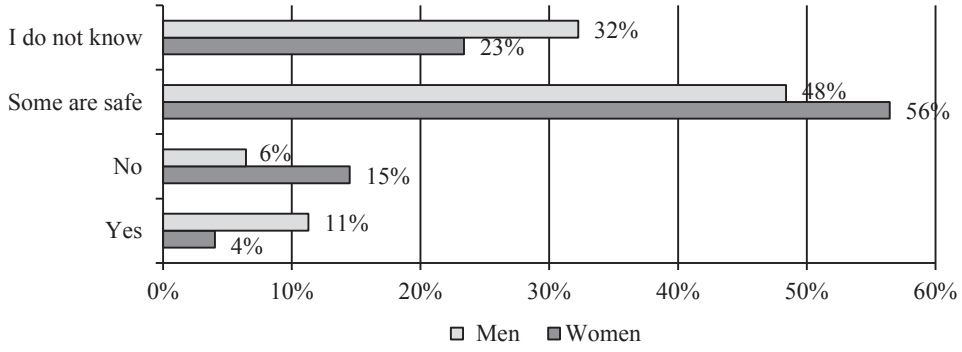

Fig. 9. Consumer opinion about the safety of legally approved sweeteners used in food in relation to respondents' sex

Rys. 9. Zależność pomiędzy płcią a opinią konsumentów na temat bezpieczeństwa dla zdrowia człowieka substancji słodzących dopuszczonych przez prawo do stosowania w żywności

Source: own data.
Źródło: opracowanie własne.

In 2009, the European Statistical Office (Eurostat) conducted a study which showed that about 28% of consumers stated food safety as one of the major priorities for EU agricultural policy [Szymańska-Brałkowska 2012].

Further surveys of 26,691 inhabitants of 27 EU member countries aged over 15 years old were commissioned by the European Commission in 2005 and in 2010,

conducted by TNS Opinion and Social [2010]. This study showed that 37% of the respondents were concerned about the safety of purchased food products and only 5% did not perceive the hazards which may occur in food. In addition, 9% of respondents pointed to the danger of food additives. According to the survey conducted by Walkiewicz [2011], food additives, and especially those added to beverages, represent the biggest threat enumerated by consumers in Poland (on average 66% of respondents) and Romania, and they may significantly affect the safety of food. In Poland, only 27% of respondents paid attention to food safety. In comparison to consumers from Cyprus (75% of the population) and Spain (54% of the population), this number is very low. On the other hand, more than 50% of the respondents on the EU market declared the need to provide more information about food safety and quality. Moreover, half of the population of EU countries would change their eating habits based on information about food safety or health and dietary guidelines. Every third consumer avoids dangerous food when they are informed by the media. Moreover, 11% of consumers decide to change their eating habits permanently following negative information in the media about a particular food product or food manufacturer [Szymańska-Brałkowska 2012].

4. Conclusion

Consumer knowledge about sweeteners is low and definitely requires the provision of education in this area. The results have shown that consumers have many difficulties with choosing sweeteners. They are not able to identify the origin of these substances and do not recognize the symbols of the substances on product packaging, they also show little interest in current information about sweeteners. It is worth noting that many people have no knowledge about whether a particular sweetener is safe or even if it is legally approved. In addition, the respondents do not fully trust the legal regulations. More than half of the respondents (53%) stated the negative effect of sweeteners, but they were not always able to identify the hazards associated with sweeteners (23%). Consumers randomly enumerated individual hazards and the benefits of sugar substitutes.

This study shows that consumers do not believe in all the information from different sources about sweeteners, but they rely on their own opinion.

The study also describes consumer willingness to limit or discontinue the use of natural sweeteners (64%) and to change their eating habits (59%). We can conclude that there are growing numbers of consumers who are uncertain about the use of sweetened additives and who are seeking more information about them and this trend is set to continue.

A low level of consumer knowledge in terms of the use of sweeteners in food production was observed. The results showed the need for providing public education about those sweeteners that may be present in food products available on the market. Therefore, programs focused on providing information about healthy sweetening agents added to food products for general consumption should be promoted.

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