

Joanna Bartkowicz
Akademia Morska w Gdyni

Tri-City Consumers Attitudes towards Eating Edible Insect as an Alternative Source of Food

Summary

Entomophagy as diet has been known since the dawn of humanity, while the European market is a novelty. The aim of the study was to analyse consumer attitudes of the Tri-City inhabitants towards the new source of nutrients which are edible insects. The survey was carried out in 2015 on a sample of 788 people from the Tri-City. The method used in the survey was a proprietary questionnaire. There were evaluated the attitudes towards entomophagy and the factors determining the intention to eat insects. As independent variables there were selected gender and age. In the study group, one third of respondents reported willingness to try the products of edible insects, which shows great openness to new foods. Consumers have shown a positive attitude towards entomophagy. The age group willing to change was a group of 21-40 years of age. The article is of the research nature. The results can be used to develop marketing strategies for new products generated with the share of raw material of the insect's origin, enriching them in protein and other nutrients.

Key words: attitudes, edible insects, Tri-City consumer, entomophagy.

JEL codes: D12, I12

Introduction

The behaviour of consumers stems from their needs. Known and available food satisfies physiological requirements of humans while securing the need for safety. Maslov placed these needs in his pyramid of needs. New food may bring anxiety and a lack of safety, since it is unknown, unstudied and unfamiliar to people. Furthermore, an internal conflict and a barrier linked to consuming new and unknown food are also involved. According to Jeżewska-Zychowicz (2007), if diversified nutrition, consumption of exotic food or using specific processing methods are trendy and appreciated in a given society, then unfamiliar food may be a way to gain respect and recognition. It also helps to break down barriers associated with accepting such food.

A relatively steady or stereotypical pattern of reaction may be the response to a new stimulus. New food may trigger ambivalent attitudes, with both positive and negative components. The consumer is curious, yet anxious, in their approach to try eating insects since the outer appearance of insects does not build trust and the knowledge of nutritional values are in conflict with attitudes towards such food. Behaviours on the food market are significantly impacted by attitudes which are reflected in constant or stereotypical ways and reactions to a given stimulus in a specific situation (Shiv and Fedorikhin 1999). Negative

attitudes towards unknown food, resulting from a lack of knowledge, existing clichés or influences originating from the social environment, may condition behaviours that strongly prevent consumers from having the chance to gain experience and knowledge of such food (Jeżewska-Zychowicz 2009).

Edible insects, as new food, triggers a lot of controversy among people in the West. Entomophagy (from Greek: entomon – an insect, phagein – to eat) consists of the eating of insects by humans. It is estimated that insects constitute a part of the traditional diet for at least 2 billion persons worldwide. Depending on the developmental stage, people consume eggs, larvae, pupae or adult specimens of some insect species. Around the world, over 2,000 insect species are consumed, predominately in developing countries in tropical and subtropical climate zones (Jongema 2015). The most ancient insect remnants originate from the Palaeozoic, Devonian rocks in Scotland and Ukraine, and their beginnings date back 350 million years (Bunalski et al. 2009). For people (hominids) of that time, the diet was based on the meat of wild animals, fish, vegetables, fruit, roots, eggs, nuts, and insects. With the development of the first stone tools, cultivation of land and domestication of animals, the nutrition of hunters-gatherers changed (Lindeberg 2005). The advantages of eating insects mainly include health benefits, environmental protection and a source of income for people (Van Huis et al. 2013).

The factors conditioning a novel source of food, i.e. edible insects, accepted by people are price and quality, benefits, risks, naturalness, trust, attitudes, culture and consumer-tailored offer. A lack of knowledge of entomophagy results in insects being perceived as “unhygienic” and a source of diseases, bacteria or infections (Lensvelt and Steenbekkers 2014). The objective of the study was to analyse the attitudes towards entomophagy (the eating of insects) among Tri-city residents and to identify the factors conditioning this phenomenon.

Methods

The study was carried out with a questionnaire method among N=788 consumers from the Tri-city using non-probability sampling. The survey was conducted in 2015. Most respondents were women: 75,1% (N=592) who described their economic status as good (71,5% of the subjects), acceptable (21,7%), very good (15,5%) or bad (1,2%). The questionnaire was based on a cafeteria-style checklist with single-choice and multiple-choice questions. The respondents were asked about their knowledge of entomophagy as a notion, its origin, their attitude towards entomophagy and encouraging and discouraging factors for the eating of insects. The questionnaire included an itemised scale and a Likert scale. The evaluation of attitudes was performed based on the bipolar rating scale while assigning the specific levels of the scales to numeric values from 1 (I do not agree at all) to 5 (I agree). The following number ranges were determined to describe specific attitudes: negative <1÷2.5>; neutral <2.5÷3.5> and positive <3.5÷5.0>. The statements with negations were re-encoded. The statistical analysis of the empirical material was carried out with a Chi² test and contingency tables at p<0,05. The characteristics of the respondents participating in the study are presented in Table 1

Table 1
Characteristic of study samples (in %)

Total	Sex		Age (years)			Education		
	N	Females	Males	≤20	21-40	≥41	Vocational	Secondary
788	592	196	284	293	211	94	425	269
100,00%	75,13%	24,87%	36,04%	37,18%	26,78%	11,93%	53,93%	34,14%

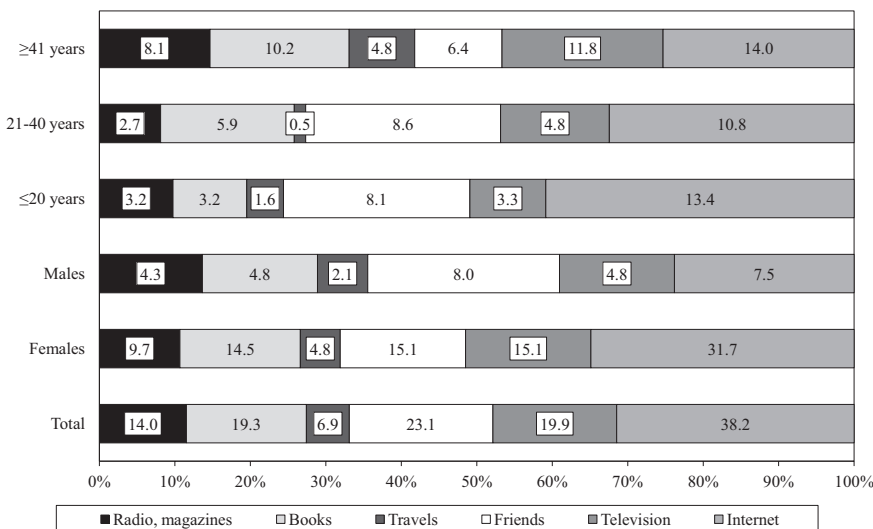
Source: Authors' own study.

The results of the study and discussion

Understand idea of Entomophagy among respondents

For Europe, entomophagy is a culturally and climatically distant nutritional approach. Over one-fifth of the respondents declared knowledge of this notion (23,6%). The respondents who knew the phenomenon indicated different sources of information on entomophagy (Figure 1), with the main being the Internet (38,2%), colleagues (23,1%), television (19,9%) and books (19,3%). Gender did not impact the events in which the respondents came across entomophagy. It is noted that for a higher proportion of people over 41 years of age, in com-

Figure 1
Situations in which respondents were confronted with information about entomophagy (percent indication)



Legend: values do not add up to 100% because respondents could give more than one answer
 Source: Authors' own study.

parison with the other age groups, television and books were the main source of information. Travel was least often indicated as a source (6,9%).

Globalization, rapid development of the Internet and modern informative technologies have a significant impact on consumer behaviour (Zalega 2015). For several years, TV channels have been broadcasting films on edible insects as a source of food. The Polish editions of *Master Chef* and *Hell's Kitchen* have also featured programs on insect dishes, such as mealworms and silkworms. The number of published books, including kitchen books, demonstrates the interest in this topic; Łuczaj (2005) in their guidebook discuss ways to use native Polish species of edible insects.

Consumers' attitude towards the statements on Entomophagy

The analysis of the study indicates that the Tri-city respondents demonstrated a neutral attitude towards the statements on entomophagy. The average values recorded in the survey of eight statements oscillated within the scope of attitudes from positive to negative. The respondents showed neutral attitudes towards the statements No. 1, 3, 4, 7 and 8, though there were significant differences between gender and age groups. The results are presented in Table 2 and also depict the significance levels.

A neutral attitude towards entomophagy allows assuming that it would be rather positive if “strong” factors occur in the information stream reaching the consumers. It should be emphasized that products made with insects are entering the Polish market. The message exerts a significant impact on how consumer attitudes develop. Consumers are willing to change their attitudes depending on who transfers the message on a given subject. It could be an unknown person or an authority. The wording of the latter is perceived as more reliable and the intentions are treated as positive. “Weak” emotional attitudes change easiest and fastest, whereas extreme positive or extreme negative mindsets are hardest to change (Rudnicki 2012).

A positive attitude towards statement No. 6 was evident in both genders and in all age groups. The respondents would like to impress others with eating edible insects ($X_{\text{mean}}=3,65$), which was especially true for the over 41-year age group, while the 21-41 age group demonstrated a neutral attitude. Such behaviour may seem surprising, yet according to sociologists, consumption has become a way to stand out and thus the need to be different is one of the determinants in a consumer society (Borowska 2009).

Low price or availability of insects would not encourage women, persons below 20 years of age and over 41 years of age, to consume insects. The youngest group of respondents and men are aware that there is a potential risk of unavailability of meat and poultry on the market. For years, the deeply rooted idea of the availability of such foodstuffs makes respondents believe that such a situation would never occur. The respondents demonstrated a positive attitude towards the statement that people who consume insects know that this is a very good source of protein and other nutrients. This fact has been confirmed in numerous

studies (Alamu et al. 2012; Ayieko et al. 2012; Van Huis et al. 2013; Yang et al. 2009; Melo et al. 2011; Ran and Zhao 2014) and some respondents may have such knowledge.

Table 2
Average point values describing the attitudes of respondents to statements about entomophagy (points)

Number of specification	Specification	The average number of points for the statements					
		Total	Sex		Age (years)		
			Females	Males	<20	21-40	≥41
1.	People who consume insects are poor, they do not have enough to eat	3,46	3,48	3,41	3,44	3,63*	3,25*
2.	People who eat insects know that this is a very good source of protein and other nutrients	3,52	3,52	3,54	3,51	3,60	3,44
3.	Consumption of edible insects is a way for the survival of the human race	2,82	2,81	2,86	2,71	2,90	2,86
4.	I will eat insects if there was a shortage of conventional sources of protein	3,01	2,91**	3,33**	2,90**	3,26**	2,83**
5.	Low price and availability of insects would encourage me to their consumption	2,38	2,32*	2,58	2,36	2,49	2,27
6.	Trying insects I would have impressed others	3,65	3,70	3,51	3,70**	3,42**	3,91**
7.	I do not consider eating insects / do not let even such a thought	2,99	2,92*	3,21*	2,86	3,02	3,11
8.	Red meat, poultry derived from conventional farming will always be available	2,61	2,62	2,57	2,41**	2,85**	2,53

Attitude: negative <1÷2,5>; neutral <2,5÷3,5>; positive <3,5÷5,0>.

*p<0,05; **p<0,01.

Source: like in Table 1.

Factors that could encourage consumers to eat insects

The degree to which a given food product appeals to a consumer is defined as preference and it reflects an emotional attitude towards perceived taste and smell sensations (Baryłko-Pikielna 2004). Since visual assessment is usually the first sensation received before attempting to evaluate something with other senses, it often determines the acceptance or rejection of a product (Babicz-Zielińska et al. 2009). For a novel product to the West culture, such as edible insects, their appearance raises extreme emotions straight away. Perceiving insects as pests instead of a food source triggers disgust.

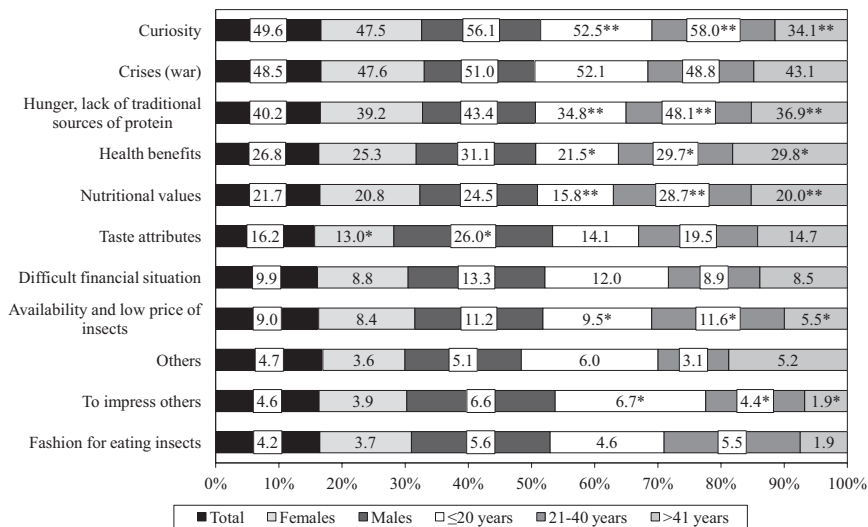
The respondents were asked whether they would take part in a consumer analysis of edible insects. Positive answers were retrieved from 36,5% of the respondents (N=288), of

whom 68,8% were women (N=198) and the age groups were categorized as follows: 44,1% ≤20 years of age, 35,8% 21-40 years of age and 20,1% ≥41 years of age. The gender and age significantly differentiate of the answers. It is possible that some people would refuse when attempting the consumer analysis due to the appearance of the product. In the study 80,2% of the respondents indicated appearance as a factor discouraging consumption.

Results from a Belgian study also suggest such behaviour; of 384 persons involved in the experiment, 49,2% attempted the consumer analysis of insects (Megido et al. 2013). This is a high proportion, considering that in Belgium only ten species of edible insects were on the market in 2014 (Federal Agency for the Safety of the Food Chain. <http://www.favv-afscsa.fgov.be/foodstuffs/insects/2014>). In Europe, insects constitute less than 2% of the total food consumption, whereas in Latin America and Africa they accounted for 39% and 30%, respectively (Johnson 2010).

According to the respondents, curiosity and crisis events (e.g. war) would most encourage them to consume insects (Figure 2). Men were significantly more (p=0,03565) curious than women (56,1% vs. 47,5% respondents). Twice as many men (26,0%) than women (13,0%) indicated taste features (p=0.00002) as a consumption-encouraging factor. The age of the respondents significantly graded the answers, referring to such factors as health benefits (p=0,04163), availability and low price (p=0,04718), the need to impress others (p=0,04074), nutritional values (p=0,00071), hunger and lack of other protein source

Figure 2
The factors leading respondents to consume insects (percent indication)



Legend: values do not add up to 100% because respondents could give more than one answer
 * p<0,05; ** p<0,01.
 Source: like in Figure 1.

($p=0,00222$) and curiosity ($p<0.00001$). Curiosity is a response to something new and the sensation of novelty is subjective in nature.

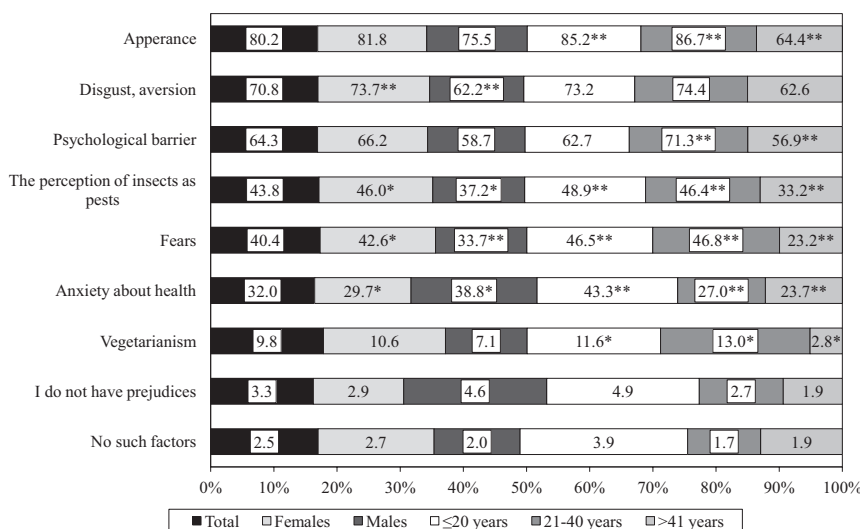
Gutkowska et al. (2014) found that Polish consumers had a mostly positive attitude towards changes on the food market, with the youth and middle-aged being most positive in their mindsets.

When given the chance to indicate other factors, the respondents reported their eagerness to try a new product while travelling abroad, yet consumption depended on the insect species. They also declared their willingness to try exotic dishes and said they would taste insects when making a bet with somebody else.

Factors causing aversion to consumption of edible insects

Among factors that trigger reluctance to try new food, the respondents enumerated appearance (80,2% individuals), disgust and aversion (70,8%) and mental barrier (64,3%). Significantly more men than women indicated health concerns (38,8% vs. 29,7%, $p=0,01860$). The statements on other factors such as fear ($p=0,02782$), disgust ($p=0,00234$) and viewing insects as pests ($p=0,03332$) were gender-determined. The data are presented in Figure 3.

Figure 3
Factors causing aversion to consumption of edible insects (percent indication)



Legend: values do not add up to 100% because respondents could give more than one answer
 * $p<0,05$; ** $p<0,01$.
 Source: like in Figure 1.

There were statistically significant differences between the age groups for the following factors: health concerns ($p < 0,00001$), vegetarianism ($p = 0,00034$), mental barrier ($p = 0,00286$), fear ($p < 0,00001$), disgust ($p = 0,00827$), perception of insects ($p = 0,00115$) and their appearance ($p < 0,00001$).

Conclusions

Concluding the results, it is believed that the respondents from the Tri-city demonstrated a neutral attitude towards entomophagy. Over a third of the respondents (36,5%) declared their willingness to participate in a consumer analysis of edible insects. For the surveyed individuals, the appearance of the insects was the biggest barrier preventing consumption (80,2%). Curiosity, crisis events (e.g. war) and hunger are factors that were indicated by 40-50%. Men were shown to be more curious than women. Twice as many men than women indicated taste features as consumption-encouraging factors.

Young consumers below 20 years of age demonstrated a negative attitude towards the statement that conventional meat might be one day be unavailable, although availability and low price would not encourage them to consume insects. The statement that insects were a very good source of protein and other nutrients were slightly more supported by the 21-40 age group than with respondents below 20 years of age. From among eleven motivating factors, this group indicated seven at the highest rates, including a lack of conventional food as a source of protein, nutritional value and availability together with low pricing of products made of insects. At the same time in this group, three major barriers that prevent perceiving insects as food were reported at the highest percentage rates: appearance, disgust and mental state. The study found a certain openness of young consumers to including insects in their diets. The ≥ 41 year of age group also discerned nutritional values and taste features of new products with insects and indicated the barriers to consumption, such as appearance, aversion, viewing insects as pests, mental barriers and fear, at the lowest percentage rates. This may be explained by greater experience and maturity, which is further supported by the fact that they were the least likely to indicate curiosity as a consumption-encouraging factor.

The knowledge of consumers and their needs and behaviours are the basis for enterprises operating in a market economy and the main problem for an organization is to break the reluctance towards accepting a new product among potential consumers. This often requires changing consumer habits and encouraging a modification of the current models of consumption (Rudnicki 2012). In a study that monitored consumer groups by consumer behaviours and volumes of purchased products in ten European countries, Poles were defined as "value seekers" open to new products. Purchasing was determined by such factors as taste, health and time-saving (McEwen 2011). It may be concluded that in the face of activities encouraging the consumption of insects in Europe, the surveyed Tri-city residents might be a target group for such strategies.

References

- Alamu O., Amao A., Nwokedi C., Oke O., Lawa I. (2012), *Diversity and nutritional status of edible insects in Nigeria: A review*, "International Journal of Biodiversity and Conservation", No. 5(4).
- Ayieko M.A., Ndong'a M.F., Kenji G.M. (2012), *Nutritional value and consumption of black ants (Carebara Vidua Smith) from the Lake Victoria region in Kenya*, "Advance Journal of Food Science and Technology", No. 4(1).
- Babicz-Zielińska E., Rybowska A., Obniska W. (2009), *Sensoryczna ocena jakości żywności*, Wydawnictwo Akademia Morska, Gdynia.
- Baryłko-Pikielna N. (2004), *Co nam oferuje zmysł smaku i węchu*, „Przegląd Piekarski i Cukierniczy”, nr 11(53).
- Borowska A. (2009), *Spółeczeństwo konsumpcyjne – charakterystyka*, „Zeszyty Naukowe Politechniki Białostockiej”, nr 14.
- Bunalski M., Piekarska-Boniecka H., Wilkaniec B. (2009), *Entomologia, entomologia ogólna 1*, PWRiL, Poznań.
- Federal Agency for the Safety of the Food Chain, <http://www.favv-afsc.fgov.be/foodstuffs/insects/2014> [access: 12.09.2015].
- Gutkowska K., Kowalczyk I., Sajdakowska M., Żakowska-Biemans S., Kozłowska A., Olewnik-Mikołajewska A. (2014), *Postawy konsumentów wobec innowacji na rynku żywności*, „Handel Wewnętrzny”, nr 4(351).
- Typy konsumentów* (2016), http://www.packaging-polska.pl/pg/pl/content/papier__tektura/_polak_poszukiwacz_typy_konsumentow.html [dostęp: 25.04.2016].
- Jeżewska-Zychowicz M. (2007), *Zachowania żywieniowe i ich uwarunkowania*, Wydawnictwo SGGW, Warszawa.
- Jeżewska-Zychowicz M. (red). (2009), *Nieznana żywność a postawy i zachowania konsumentów*, Wydawnictwo SGGW, Warszawa.
- Johnson D.V. (2010), *The contribution of edible forest insects to human nutrition and forest management*, (in: "Forest Insects as Food: Humans Bite Back, FAO of the United Nations Regional Office for Asia and the Pacific", Bangkok).
- Jongema Y. (2015), *World list of edible insects*, http://www.wageningenur.nl/upload_mm/7/4/1/ca8baa25-b035-4bd2-9fdc-a7df1405519a_WORLD%20LIST%20EDIBLE%20INSECTS%202015.pdf [access: 01.06.2016].
- Kinyuru J., Kenji G., Muhoho S., Ayieko M. (2011), *Nutritional Potential of Longhorn Grasshopper (Ruspolia differens) Consumed in Siya District, Kenya*, "Journal of Agriculture, Science and Technology", No. 12(1).
- Lensvelt E., Steenbekkers L.P. (2014), *Exploring Consumer Acceptance of Entomophagy: A Survey and Experiment in Australia and the Netherlands*, "Ecology of Food and Nutrition", No. 53.
- Lindeberg S. (2005), *Paleolithic diet ("stone age" diet)*, "Scandinavian Journal of Nutrition", No. 49(2).
- Łuczaj Ł. (2005), *Podręcznik robakożercy czyli jadalne bezkręgowce Środkowej Europy*, Chemigrafia, Krosno.
- McEwen S. (2011), *What do consumers want*, http://www.procarton.com/files/file_manager/press_0611/p_0611_he_e.html [access: 04.06.2016].

- Melo V., Garcia M., Sandoval H., Jimenez H., Calvo C. (2011), *Quality proteins from edible insects food of Latin America and Asia*, "Emirates Journal of Food and Agriculture", No. 23(3).
- Megido R., Sablon L., Geuens M., Brostaux Y., Alabi T., Blecker Ch., Drugmand D., Haubruge E., (2014), *Edible Insects Acceptance By Belgian Consumers: Promising Attitude For Entomophagy*, "Development. Journal of Sensory Studies", No. 29.
- Ran W., Zhao Ch. (2014), *Research Progress on the Development and Utilization of Proteins in Edible Insects*, "Agricultural Science and Technology", No. 15(4).
- Rudnicki L. (2012), *Konsument w polityce rozwoju nowego produktu*, „Zeszyty Naukowe Małopolskie Wyższej Szkoły Ekonomicznej w Tarnowie”, nr 20(1).
- Rudnicki L. (2012), *Zachowania konsumentów na rynku*, PWE, Warszawa.
- Shiv B., Fedorikhin A. (1999), *Heart and Mind in Conflict: the Interplay of Affect and Cognition in Consumer Decision Making*, "Journal of Consumer Research", No. 26(3).
- Van Huis A., van Itterbeeck J., Klunder H., Mertens E., Halloran A., Muir G. Vantombe P. (2013), *Edible insects: Future prospects for food and feed security*, "FAO Forestry Paper", UNFAO, Rome.
- Yang Y., Tang L., Tong L., Liu H. (2009), *Silkworm culture as a source of protein for humans in space*, "Advances in Space Research", No. 43(8).
- Zalega T. (2015), *Innowacje a konsumpcja i zachowania konsumpcyjne- wybrane zagadnienia*, „Handel Wewnętrzny”, nr 2.

Postawy konsumentów rynku trójmiejskiego wobec owadów jadalnych jako alternatywnego źródła żywności

Streszczenie

Entomofagia jako sposób żywienia znana jest od zarania dziejów ludzkości, natomiast na rynku europejskim jest nieznana. Celem pracy jest analiza postaw konsumentów rynku trójmiejskiego wobec niekonwencjonalnego źródła żywności, jaką są owady jadalne. Badanie zrealizowano w 2015 roku w grupie 788 osób z Trójmiasta metodą ankietową za pomocą autorskiego kwestionariusza ankietowego. Ocenie poddano postawy wobec entomofagii oraz czynniki motywujące i ograniczające spożywanie owadów. Jako zmienne niezależne wybrano płeć oraz wiek. W badanej grupie ponad jedna trzecia zgłosiła gotowość spróbowania produktów z owadami jadalnymi. Były to osoby młode do 20. roku życia, zarówno kobiety, jak mężczyźni, kobiety w wieku 21-40 lat oraz mężczyźni w wieku powyżej 41 lat. Artykuł ma charakter badawczy. Uzyskane wyniki mogą posłużyć do opracowania strategii marketingowych dla nowych produktów, powstałych z udziałem surowca pochodzącego od owadów, wzbogacających je w białko i inne składniki odżywcze.

Słowa kluczowe: postawy, owady jadalne, trójmiejski konsument, entomofagia.

Kody JEL: D12, I12

Отношение потребителей на рынке Труймяста к поеданию насекомых в качестве альтернативного источника продуктов питания

Резюме

Энтомофагия в качестве способа питания известна уже на заре человечества, тогда как на европейском рынке она неизвестна. Цель работы – анализ отношения потребителей на рынке Труймяста (Троеграда) к неконвенциональному источнику продуктов питания, каким являются съедобные насекомые. Обследование провели в 2015 г. в группе 788 человек из Труймяста по методу опроса с помощью авторского вопросника. Оценили отношение к энтомофагии, а также факторы, мотивирующие к поеданию насекомых и ограничивающие его. В качестве независимых переменных избрали пол и возраст. В обследуемой группе более одной трети респондентов заявили готовность попробовать продукты со съедобными насекомыми. Ими были молодые лица, а возрасте до 20 лет, как женщины, так и мужчины, женщины в возрасте 21-40 лет и мужчины в возрасте свыше 41 года. Статья имеет исследовательский характер. Полученные результаты могут послужить разработке маркетинговых стратегий для новых продуктов, возникших с долей сырья, происходящего от насекомых, обогащающего их белками и другими питательными веществами.

Ключевые слова: отношение, съедобные насекомые, потребитель Троеграда (Труймяста), энтомофагия.

Коды JEL: D12, I12

Artykuł nadesłany do redakcji we wrześniu 2016 roku

© All rights reserved

Afiliacja:

mgr Joanna Bartkowicz

Akademia Morska w Gdyni

Wydział Przedsiębiorczości i Towaroznawstwa

Katedra Handlu i Usług

ul. Morska 81-87

81-225 Gdynia

e-mail: j.bartkowicz@wpit.am.gdynia.pl