SELECTED PROBLEMS OF CONSUMER ACCEPTANCE
OF INNOVATIVE FOOD PRODUCTS

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Introduction/background: Consumer reluctance to try new, formerly unknown foods poses a serious obstacle for the development of innovations in the food market. Considerable attention has been given to the threats perceived by consumers related to eating selected innovative foods: genetically modified food (GMF), convenience food and functional food.
Aim of the paper: This paper is aimed at indicating factors that shape consumer acceptance of innovative food products. The research was focused on establishing the association between the attitude towards new food and the selected demographic (age, sex) as well as psychological traits (the speed of adopting innovation based on Rogers' Diffusion of Innovation Theory) of the respondents.
Materials and methods: The paper presents the results of the authors' own studies conducted among Polish consumers using the direct survey method. The research was carried out in 2019 and involved employing a purposive sampling technique (n = 240). The data were analysed utilising the following methods: analysis of the internal consistency of the attitude scale using Cronbach's alpha, k-means cluster analysis, contingency tables.
Results and conclusions: The 9-item Food Neophobia Scale (FNS) was reduced to three variables: enthusiasm, neutrality and reluctance. These variables were subjected to k-means cluster analysis, which resulted in identifying two homogenous groups with similar attitude towards new food. We have found a statistically significant association between belonging to a cluster-based on the approach to innovative food and the speed of accepting innovation using Rogers' model of diffusion of innovation – and the sex and age of the respondents.

Keywords: consumer attitudes, consumer acceptance of innovation, consumer perceived risk, food innovation.

1. Introduction

The food market undergoes dynamic development thanks to technological progress in agriculture and industry. Traditional as well as internet media, providing both information and advertising content, play an important role in the public discussion on nutrition. The Internet

represents a specific type of media that enables fast dissemination of information as well as direct information exchange among consumers. A wide-ranging discussion on food and nutrition has an impact on shaping consumers' attitudes and on consumers' purchasing decisions (McCluskey, Kalaitzandonakes, Swinnen, 2016, pp. 467-486). Consumers make more conscious dietary choices and confront food producers with increasingly difficult challenges. Currently the food market is shaped by various fads and trends that must be carefully observed by food producers, especially when it comes to developing new food products (Si, 2020, pp. 305-321). The purpose of this paper is to indicate factors affecting consumer acceptance of innovative food products. We have searched for the association between the attitude towards new food (positive/neutral/reluctant) and demographic traits, such as the age and sex of the respondents, and the speed of welcoming innovation according to the model of diffusion of innovation developed by Rogers.

2. Consumer resistance to innovation: perceived threats and food neophobia

Developing innovative products becomes a necessity for producers operating in the increasingly competitive food market (Makała, Olkiewicz, 2004, pp. 121-124). Given the constant growth in consumer expectations, the range of products delivered by food producers must constantly change and expand. The main trends in developing new food products emerge as a result of needs communicated by consumers and by the technological solutions available at a given time. According to the literature, innovative food is commonly subdivided into three categories: convenience food, GM food, and functional food (Gawęcki, 2002, pp. 5-15; Lähteenmäki, Grunert et al., 2002, pp. 523-533; Tuorila, 2001; Urala and Lähteenmäki, 2004, pp. 793-803). From the consumers' point of view, innovations in the food market are completely subjective and frequently constitute minor modifications of the product, e.g. connected with changing packaging design, finding innovative uses or new functionalities (Babicz-Zielińska, Dąbrowska, 2011, p. 40).

The innovations introduced by manufacturers do not always meet with favorable reception from consumers. Genetically-engineered foods represent a category that arouses a considerable concerns due to limited knowledge about genetic modifications, difficulties in providing an explicit definition of genetically modified organisms (GMO), general lack of widespread understanding for scientific achievements, ethical dilemmas, and religious beliefs as well as the inability to indicate the benefits GMO could deliver (Rzymski, Królczyk, 2016, p. 690). Convenience food that can be prepared quickly and easily, which represents an obvious advantage, is highly-processed and perceived by consumers as unhealthy and unnatural (Botonaki, Mattas, 2010, p. 630; Brunner, van der Horst, Siegrist, 2010, p. 499). As healthy

lifestyle trends continue to grow, one could expect that functional food should meet market demands. Unfortunately, due to lack of legal regulations, this type of food is not widely known and accepted among consumers (Annunziata, Vecchio, 2013, pp. 350-351; Krygier, Florowska, 2008, p. 2; Kudełka 2011, p. 291). Besides consumer perceptions of threats associated with the types of food discussed above, the innovation on the food market can be seriously hindered by reluctance to try unknown food products.

Trying innovative food is somehow tantamount to taking a risk. Fear of the unknown and selecting products that we are familiar with represent typical human reactions (Dolgopolova, Teuber, Bruschi, 2015). Negative attitude towards different food forms and nutrition is often associated with the lack of products knowledge (Babicz-Zielińska, 2006, p. 379). Fears and lack of trust in new technologies applied in food production are strongly correlated with reluctance to try novelties (Cox, Evans, 2008, p. 704; Royzman, Cusimano, Leeman, 2017, pp. 466-467). Consumer reluctance to eat new, unknown foods is defined as food neophobia (Tuorila, Hartmann, 2020, pp. 1-2). This eating trait is understood as an attitude towards food manifesting as avoidance of trying new products (Babicz-Zielińska, 2006, p. 380). The level of food neophobia depends, among others, on the following factors: age, sex, place of residence (town/village), income, education, psychological characteristics (attitude towards innovation), genetic factors, cultural traits, purchasing knowledge and experience, and sensory sensitivity (Kowalczuk, Fusiek, Nowocień, 2017, p. 76).

3. Research methodology

The results presented and analysed here were obtained in the course of the authors' own research conducted in 2019 among Polish consumers using direct survey as the research technique. Purposive sampling involved taking into account respondents' age (two categories) and sex (two categories). The analyses presented in this paper were carried out based on answers provided by 240 respondents. Questionnaire survey was used as a research tool. The questions in the questionnaire regarded consumers' attitudes towards innovative food products as well as their habits and behaviour connected with trying new foods that they have not sampled before.

With regard the questionnaire, two measuring scales were adopted based on available literature. The first used in the study was applied to assess food neophobia. Original Food Neophobia Scale (FNS) consists of 10 statements (10-item test) about trying novel foods (Pliner, Hobden, 1992, pp. 105-120). Our questionnaire included 9 statements taken from that scale[1]. The second scale was based on the model of diffusion of innovation devised by Rogers (Rogers' Diffusion of Innovation Theory). According to that model, it is natural that consumers

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[1] The statement 'I like to try new ethnic restaurants' was omitted, as the research was focused on the consumers' attitude towards new food products selected during everyday grocery shopping.

differ with regard to accepting innovations. 'Innovators', who are the first to welcome innovations, usually constitute a small percentage of the population. 'Early adopters' are relatively less innovative. The following groups, comprising the majority of consumers, include the 'early majority', who hesitate to adopt novelties, and 'late majority', who are skeptical about innovation. The last group consists of laggards, who are conservative and do not like changes (Rogers, 1983, pp. 248-251). That question was aimed at identifying respondents' general attitude towards innovations on the food market.

4. Results

4.1. Consumer acceptance and distrust in new foods

In order to evaluate consumers' attitude towards new, formerly unknown food, the analysis of multi-item scale consisting of nine variables/statements taken from the original Food Neophobia Scale (Pliner, Hobden, 1992, p. 109) – was conducted. The items used are presented in Table 1. The respondents were asked to evaluate to what extent they agree with the statements using the 7-point Likert scale.

Table1.
Items of FNS used in the research

Item symbol	Scale item
FNS 1	I will eat almost anything.
FNS 2	I am constantly sampling new foods.
FNS 3	I like trying foods from different countries.
FNS 4	At parties, meetings, dinners, I am eager to try new foods.
FNS 5	I treat new foods without emotion.
FNS 6	If the food looks too exotic, I have doubts whether to eat it.
FNS 7	I am afraid to taste anything that I have never had before.
FNS 8	If I don't know what is in a food, I won't try it.
FNS 9	I like traditional dishes; I don't try new foods.

Source: own elaboration based on Food Neophobia Scale (Pliner, Hobden, 1992, p. 109)

It is worth pointing out that the table presented above can be divided into three sub-scales (as indicated by factor analysis). The first sub-scale consists of positions from FNS 1 to FNS 4 that are connected with a positive attitude towards trying new foods. The second one is neutral and includes a single item (variable FNS 5). Variables from FNS 6 to FNS 9 constitute a distrust scale. The first (enthusiasm) and third (distrust/reluctance) scale represent multi-item scales (4-item scales). The analysis of internal consistency of these scales, based on Cronbach's alpha (Cronbach, 1951, pp. 297-334) and average correlation, indicated that they are internally consistent. Cronbach's alpha for the enthusiasm scale amounted to 0,8719, while the average correlation amounted to 0,6546. With regard to the distrust scale, Cronbach's alpha reached the value of 0,8253, with the average correlation between the items amounting to 0,5503.

According to Nunnally (Nunnally, 1978, p. 245; DeVellis, 2012, pp. 109-110) the values for Cronbach's alpha obtained here are acceptable and are recommended for basic research. The results demonstrate that all four items in the analysed scales measure the same aspect of the studied phenomenon and constitute single dimensional scales. For that reason it was possible to use arithmetic mean as a variable representing each dimension and reducing four items to one synthetic variable. Thus, each sub-scale reflecting the attitude to new, unknown food was represented by one variable. Mean values obtained for particular dimensions and standard deviation are shown in Table 2.

Table 2.
Mean values and standard deviation for identified three sub-scales (all respondents)

Variable	Total	
	Mean	**SD**
Enthusiasm	4,36	1,5935
Neutrality	3,54	1,7425
Reluctance	3,26	1,4977

Source: own elaboration.

The next step involved identifying homogenous groups (clusters) in terms of attitudes towards new foods. K-means cluster analysis (Mooil, Sarstedt, 2011, p. 255) with the use of three variables representing acceptance scales (enthusiasm, neutrality, reluctance) was performed. Analysis of variance revealed that for two homogenous groups all three variables diversify clusters at the level p = 0,000000, as presented in Figure 1.
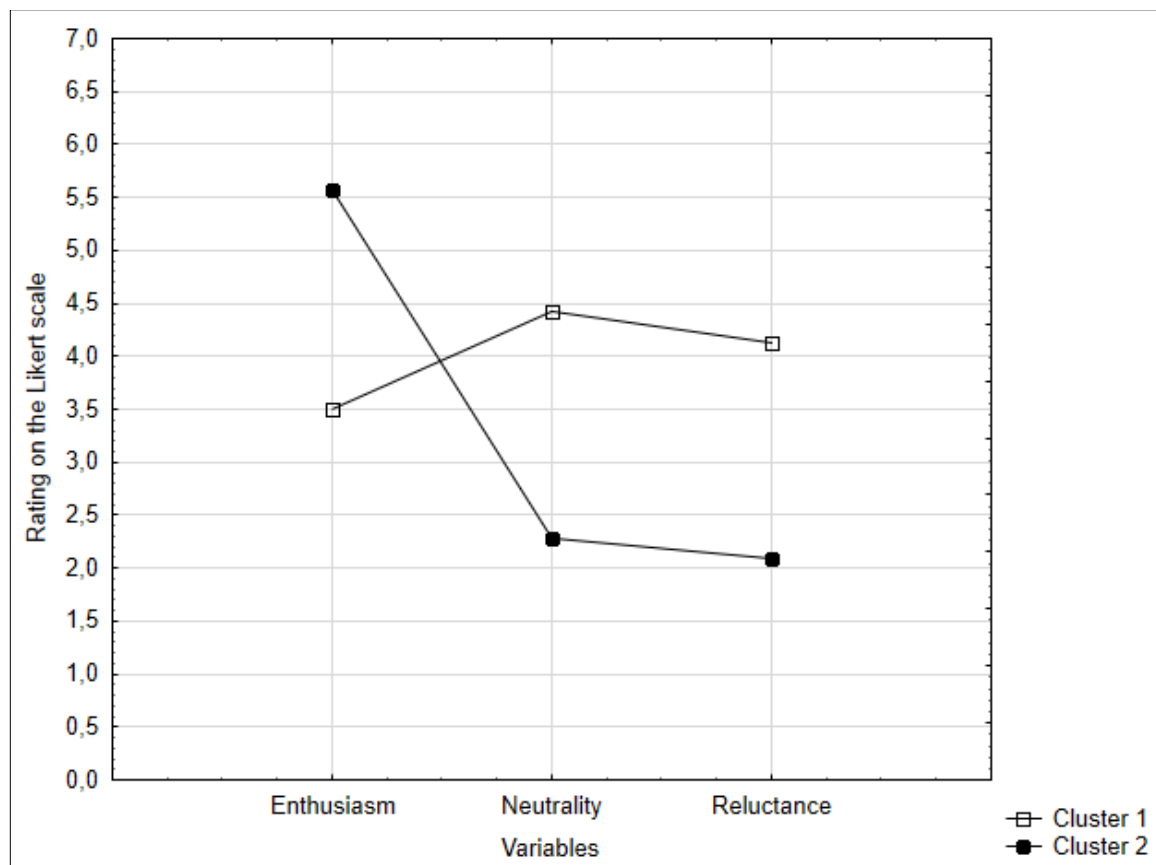

Figure 1. Graph of mean values calculated for each cluster. Source: own elaboration.

The first cluster, including 140 persons, was designated 'reserved'. This group is rather reluctant to try new food products and treats them with high level of distrust. The second cluster includes 'enthusiasts'. Mean values obtained for the neutral and distrust scale were very low, which indicates that respondents from that cluster were not afraid of novelties. Quite the opposite; they are eager to taste new foods, which is clearly seen from the high score on the enthusiasm scale. Standard deviation presented in the table indicates that answers delivered by respondents assigned to the second cluster were more diversified. Means for particular variables and corresponding standard deviation are shown in Table 3.

Table 3.
Mean values calculated for each cluster

Variable	Cluster 1 'Reserved' N = 140		Cluster 2 'Enthusiasts' N = 100	
	Mean	SD	Mean	SD
Enthusiasm	3,50	1,1208	5,58	1,2842
Neutrality	4,43	1,0759	2,29	1,5738
Reluctance	4,12	0,7683	2,09	1,3056

Source: own elaboration.

Subsequent stages of the analysis involved studying the relationship between belonging to a homogenous group and the respondents' demographic characteristics, such as sex (two categories) and age (two categories). Men outnumbered (59%) women (41%) in the 'reserved' cluster. There were 22% more women in the cluster 'enthusiasts' as compared to the first cluster, while men constituted 37% of 'enthusiasts'. The observed association is statistically significant (p = 0,00066), but weak (Phi coefficient amounts to 0,2197, while contingency coefficient to 0,2146). Men displayed reluctance towards innovative foods more often than women. The first cluster included more respondents aged between 35 and 64 (56%). The trend was opposite among enthusiasts. The majority of enthusiasts (59%) constituted young people, aged between 18 and 34. The association between the assignment to a given cluster and age was statistically significant, assuming $\alpha = 0,05$ (p = 0,01844). However, this relationship is very weak (Phi coefficient amounts to -0,1521, while contingency coefficient to 0,1504). Enthusiastic attitude towards innovative food weakens with age. Assignment to clusters considering age and sex is presented in Figures 2 and 3.
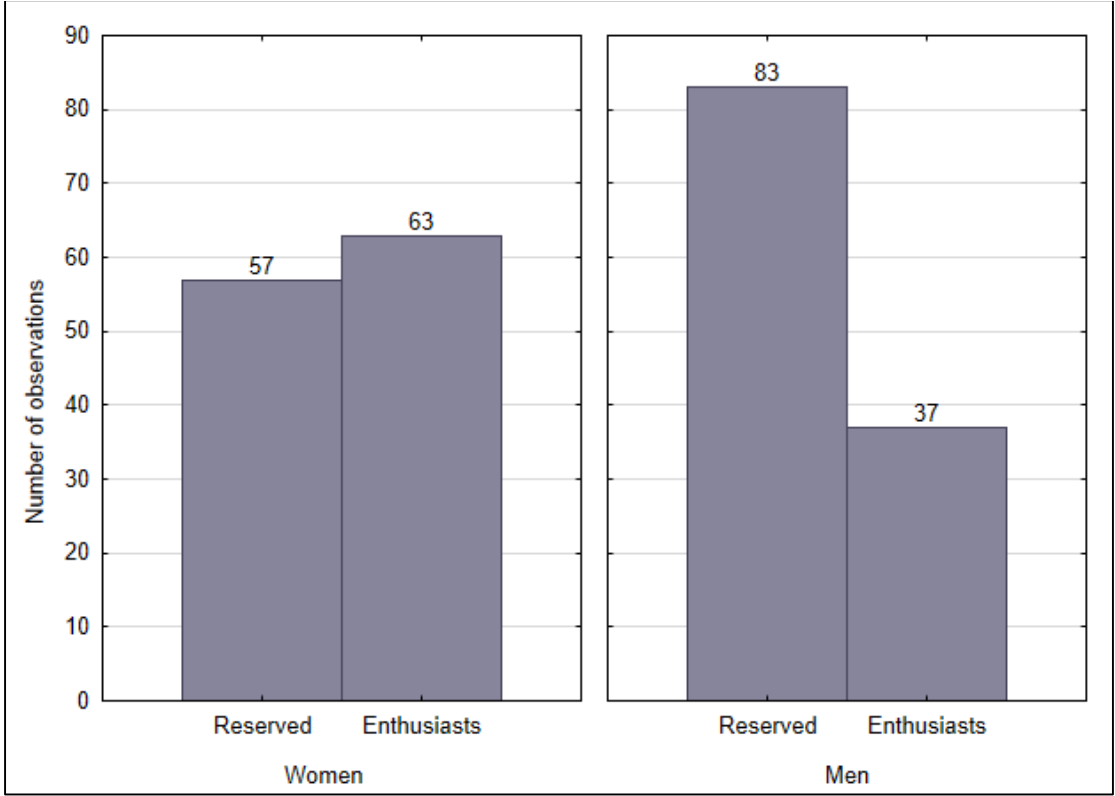
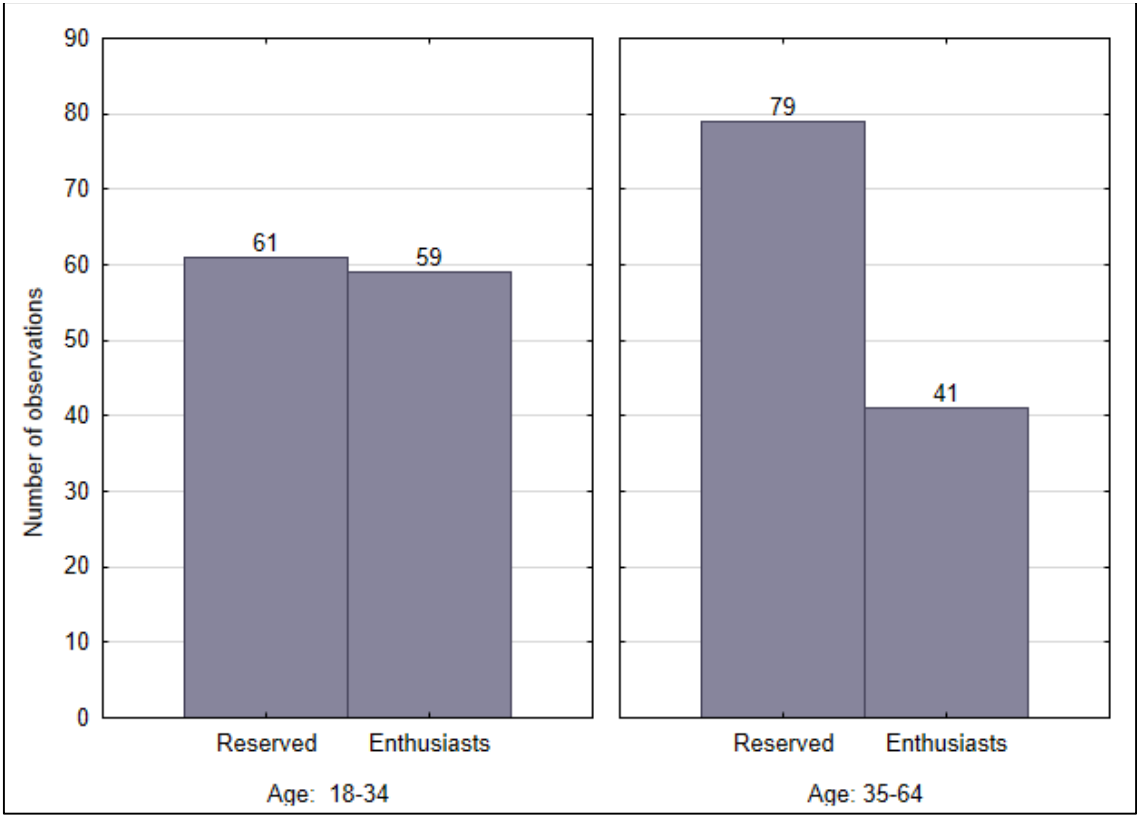**Figure 2.** Revealed cluster versus sex. Source: own elaboration.

Figure 3. Revealed cluster versus age. Source: own elaboration.

4.2. Acceptance of innovative food versus the speed of acceptance of innovations based on Rogers' Diffusion of Innovation

The questionnaire included the following closed question: 'What is your attitude towards innovations appearing on the food market?' It was devised to assess the speed at which food innovation was adopted by the consumers. The respondents were allowed to select one of five statements derived from Rogers' Diffusion of Innovation Theory:

- I like to be the first to have it, when a new food product appears on the market;
- I buy relatively quickly, but after some thought;
- I buy when some friends have tried it already;
- I buy when most of my friends have already bought it and assessed it positively;
- I'm reluctant to buy.

Based on the reply determining respondents' attitude towards innovations (in terms of the speed of its adoption), they were assigned to appropriate groups. Detailed results are presented in Table 4. Innovators represented the least numerous group, consisting of as few as 2% of all survey participants. The next three groups (early adopters, early majority, late majority) comprised a similar number of respondents, those between 62 and 65. Laggards represented almost one fifth of all respondents.

Table 4.
The speed of adopting innovations in the food market based on Rogers' Theory

Group name	Number	Cumulative number	Percentage	Cumulative percentage
Innovators	5	5	2,08	2,08
Early Adopters	65	70	27,08	29,17
Early Majority	64	134	26,67	55,83
Late Majority	62	196	25,83	81,67
Laggards	44	240	18,33	100,00

Source: own elaboration.

Due to the low number of innovators in the studied sample, this group was merged with early adopters to carry out subsequent analyses. Then, the association between the speed of adopting innovation based on Rogers' model and assignment to a homogenous group in accordance with attitude towards innovative food was examined.

Table 5.
The speed of adopting innovations versus assignment to homogenous group

Group name	Assignment to cluster		Total
	Reserved	**Enthusiasts**	
Early Adopters	23	47	70
% from the column	16,43%	47,00%	
Early Majority	42	22	64
% from the column	30,00%	22,00%	
Late Majority	39	23	62
% from the column	27,86%	23,00%	

Cont. table 5.

Laggards	36	8	44
% from the column	25,71%	8,00%	
Total	140	100	240

Source: own elaboration.

The structure of both homogenous groups obtained, based on the attitude towards innovative foods (modified FNS scale), differs primarily with respect to the number of respondents assigned to extreme groups based on Rogers' Diffusion of Innovation Theory. Early adopters were fewest in numbers of the groups in the reserved cluster (16,4%), while the number cluster enthusiasts was the largest, constituting almost half of all cases. As regards laggards, the situation is the complete opposite: the reserved cluster numbers over three times more respondents (25,7%) than cluster enthusiasts (8,0%). Graphic representation of the analysed association is shown in Figure 4.
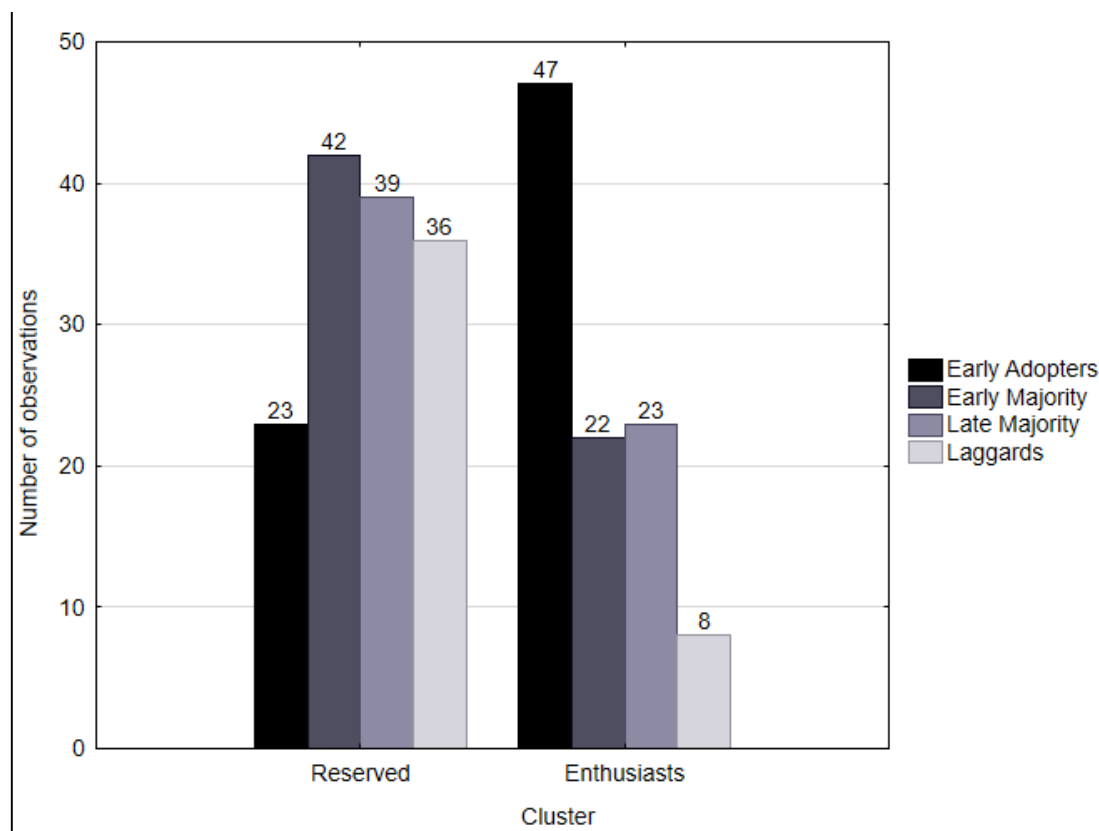

Figure 4. Cluster versus the speed of adopting innovation based on Rogers' model. Source: own elaboration.

The p-value (p = 0,00000) indicates the existence of association between belonging to a homogenous group and the speed of adopting innovations by consumers. This relationship is slightly stronger in the case of previous analyses, but still classified as weak (Cramer's V = 0,3571).

5. Conclusions

In the present study, we attempted to identify factors that have an impact on consumers' acceptance of innovative food products by applying two popular measuring scales: Food Neophobia Scale (10-item scale; 9 items were selected for the purpose of this research) and the model of diffusion of innovation (Rogers' Diffusion of Innovation Theory; 5-point scale). An initial factor analysis revealed that the first scale (FNS) can be reduced to three attributes designated: enthusiasm (four internally consistent items of the FNS scale), neutrality (one item in the FNS scale), and distrust (four internally consistent items). K-means cluster analysis for these three new variables resulted in creating two homogenous groups displaying a similar attitude towards innovative foods. The majority of respondents (58%) represented the 'reserved' cluster, as they expressed their lack of interest innovelty foods and their reluctance to try them. The cluster innovative-foods 'enthusiasts' comprised 42% of all study participants, which indicates that there is plenty of opportunity to expand this market. The research demonstrates that the attitude towards new, unknown food is associated with the consumer propensity generally to adopt innovations quickly (Rogers' Diffusion of Innovations Theory). As shown in this paper, women show more positive attitude towards innovative food than men, and that the reluctance to novelty foods is greater in the older age group. That being the case, the major difficulty involves reaching older citizens (including men). Currently, the easiest way to convey convincing information is to reach Internet users, which describes almost all young and middle-aged persons. Thus, in the future, launching new food products targeted at senior citizens will be easier.

Functional food with proven health effects, constituting one of the innovative food products discussed in the theoretical part of the paper, seems to be the most promising in terms of developing the market. Food producers who plan to design innovative foods boosting health are challenged with convincing reserved and distrustful consumers to make a purchase. Moreover, functional foods should be targeted mostly at older populations and the most difficult task in this respect is concerned with reaching senior consumers. As regards the scientific community, it should focus on advancing methodology to enable detailed time-trend analysis of this phenomenon. When it comes to FNS scale, it would be beneficial to introduce three additional items into the neutral sub-scale to obtain the same number of positions for all analysed variables. Additionally, more attention should be given to the psychographic characteristics of the respondents and to the application of qualitative methods to understand the basis of the reluctance of the older part of our society to avail themselves of scientific achievements in innovative foods, especially those intended for the improvement of health.

Acknowledgements

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