

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/365964671>

# Consumer perceptions of functional foods with antioxidant and anticancer potential

Article · December 2022

CITATIONS

0

READS

65

4 authors, including:



Ravi Jadeja

Oklahoma State University - Stillwater

56 PUBLICATIONS 506 CITATIONS

SEE PROFILE



Cristina Popovici

Technical University of Moldova

164 PUBLICATIONS 310 CITATIONS

SEE PROFILE

## CONSUMER PERCEPTIONS OF FUNCTIONAL FOODS WITH ANTIOXIDANT AND ANTICANCER POTENTIAL

E. ROBU<sup>1</sup>, E. SERGHEEVA<sup>1</sup>, R. JADEJA<sup>2</sup>, C. POPOVICI<sup>1,2\*</sup>

<sup>1</sup> Technical University of Moldova, Faculty of Food Technology, 168 Stefan cel Mare si Sfânt blvd., MD 2004 Chisinau, REPUBLIC OF MOLDOVA

<sup>2</sup> Oklahoma State University, Robert M. Kerr Food & Ag Products Center, OK 74078, United States of America

\*Corresponding author: [cristina.popovici@toap.utm.md](mailto:cristina.popovici@toap.utm.md)

**Abstract:** The article offers a general overview of the survey conducted among the population of the Republic of Moldova in order to identify the attitude of consumers to functional foods with antioxidant and anti-carcinogenic potential, and their further development and introduction to the market. 150 respondents took part in the online survey. The survey participants were presented with 14 questions from three main groups: social, basic and final. The results of the survey revealed that, despite the active development and introduction of functional food products into public catering production, most of the respondents, 41%, do not have sufficient information. Detailed study of nutrition in cancer and functional products in general (74%) It is important for the respondents, and they (69%) also consider it necessary to expand the range of this group of products in the territory of the Republic of Moldova.

**Key words:** consumer perception, functional food, antioxidant and anticancer potential, technological process and food development.

### 1. Introduction

For the first time the term "functional food products (FFP)" appeared in Japan in the 80s of the XX century. The leaders in their production are the UK, Japan, China and the USA (Arai, 1996). Despite the amazing achievements of scientific and technological progress, human nutrition has deteriorated significantly (Young *et al.*, 2000). With the active development of public catering enterprises, especially establishments specializing in fast food, people stopped caring about the quality of their diet (Küster-Boludaa *et al.*, 2017).

It is important to learn how to properly evaluate the consumed products by the criterion of their digestibility by the body, it is also necessary to understand how these or other products are useful for all internal processes. Majority of people have discounted the importance of a healthy, balanced diet (Hong *et al.*, 2020).

However, it is nutrition that can cause diseases such as obesity, diabetes mellitus, and also leads to the formation of plaques on the walls of blood vessels and the development of

cancer (Siddhita *et al.*, 2021). According to statistics, every year more than 5 million people become victims of cancer (WHO, 2020). Malignant tumors have become one of the main causes of mortality in the population (WHO, 2020; Halliwell *et al.*, 2009).

This topic is more relevant than ever today, people who are faced with a diagnosis of "cancer" especially need proper nutrition (Nestle *et al.*, 1996; Nazer *et al.*, 2019). Due to insufficient intake of essential nutrients, a person's condition may worsen, the disease will progress (Birben *et al.*, 2012; Langseth *et al.*, 1995).

On the territory of the Republic of Moldova, there is an extremely poor assortment of FFP with antioxidant and anti-carcinogenic potential, taking into account this information, the main goal of the study was set: to assess the possibilities of further adaptation of this group of products, to study consumer awareness, trust and attitude to FFP.

## 2. Materials and methods

### 2.1. Survey respondents

The survey was conducted among residents of the Republic of Moldova online. Participants were offered 14 questions to study. The study involved 150 respondents over the age of 18, and mostly students and teachers of the Technical University of Moldova. Analyzing the results of the survey, presented in more detail in Chapter 3, all the survey participants were classified according to certain criteria:

- actualizers, these are those who have an open view on the emergence of new foods with antioxidant and anti-carcinogenic potential, this group of respondents mainly includes the female half of the population, over 30 years old;
- consumers with conservative views, they are not ready for radical changes, they will hardly change their habits regarding food and products, pensioners and respondents who reacted neutrally to the topic under discussion entered this category;
- experimenters, those who follow innovations and more often purchase food products thoughtlessly, they include young people, up to 20 years old.

### 2.2. Research methodology

Within the framework of the study, a qualitative method was used to study the perception of the population of the Republic of Moldova regarding

functional foods with antioxidant and anti-carcinogenic potential. The method of questioning consumers makes it possible to more effectively assess the situation regarding the needs of people in this group of products, and it is also possible to make a forecast for their further development in the country.

When conducting the survey, the main research directions were applied:

- analysis of consumers by age category, gender, social category;
- analysis of consumers' attitude to healthy eating, as well as their willingness to abstain from harmful habits;
- study of the level of awareness of the population regarding the impact of nutrition on human health;
- study of the level of awareness of the population regarding the existence of foods with antioxidant and anti-carcinogenic potential;
- analysis of the attitude of consumers to the creation of functional food products, and their subsequent implementation at public catering enterprises.

### 2.3. Working research tool

All the questions presented in the questionnaire are formulated mainly in a short form, without complicated turns, for a clearer understanding by all the survey participants, they were also grouped into separate categories and analyzed (Fig. 1., 2., 3.).

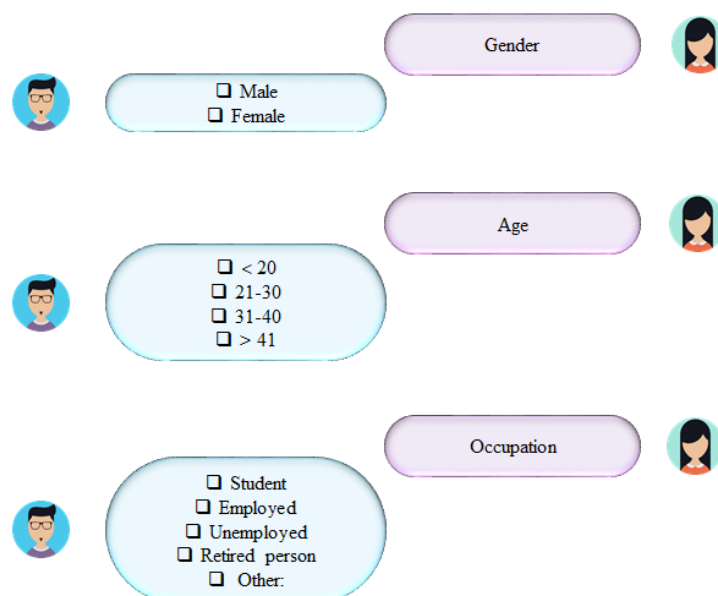
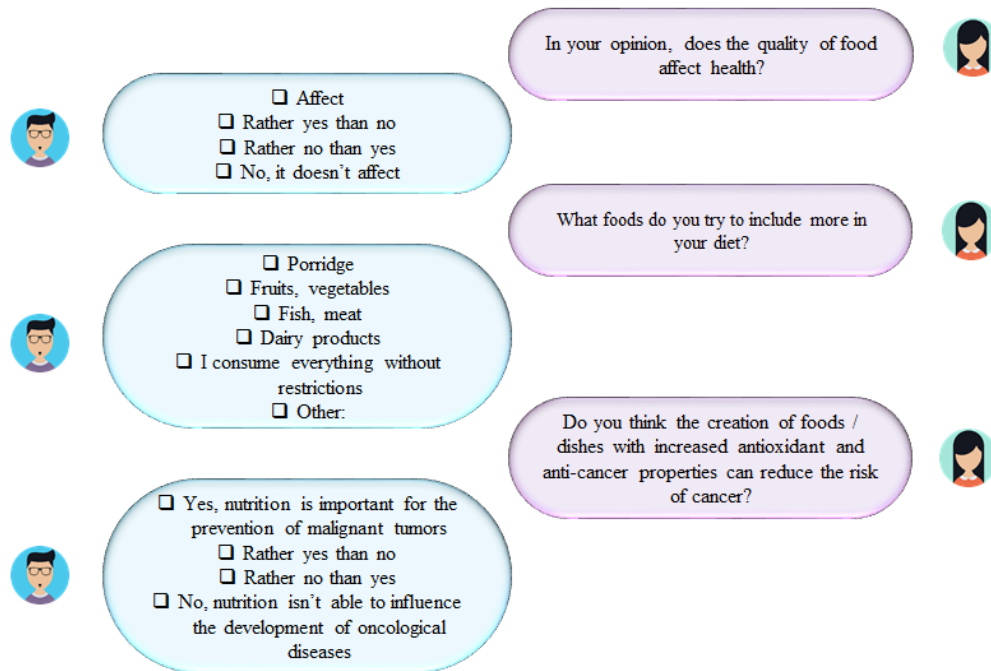


Fig. 1. 1<sup>st</sup> group: Social Questions

The significance of social issues lies in the fact that they allow you to establish contact with the respondent, gain his trust, and they also help

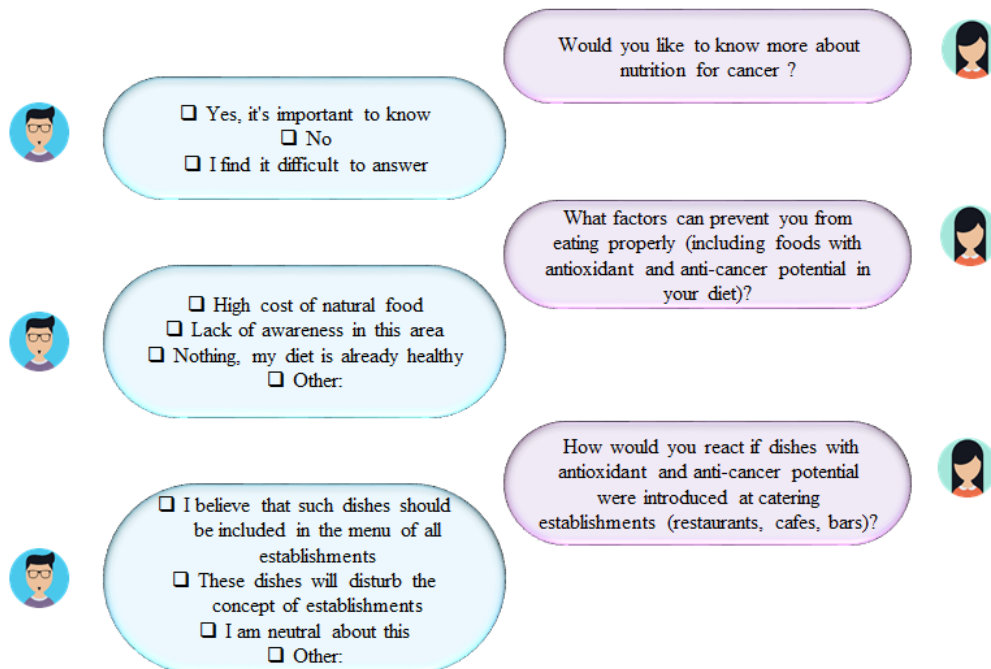
to characterize a person, identify which group of the population is more interested in solving the problem.



**Fig.2.** 2<sup>nd</sup> group: Basic Questions

This group of questions allows you to get information about the respondents' attitude to nutrition in general, and it is also possible to

identify how consumers are aware of functional foods with anti-carcinogenic and antioxidant potential.



**Fig. 3.** 3<sup>rd</sup> group: Final Questions

The final questions in the questionnaire are necessary to supplement the respondents' personal data, in this study, the third group of questions makes it possible to analyze the perception of each participant in the questionnaire regarding the creation of functional food products on the territory of the Republic of Moldova, as well as the willingness of the population to include them in their diet.

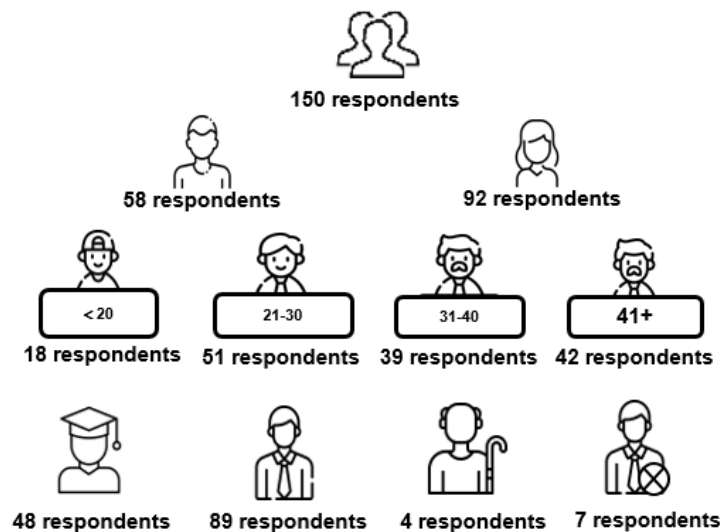
When compiling the questionnaire, it was important to preserve the logical relationship between the questions and answers, to prevent their ambiguity. To conduct further research, it

was expected to determine the level of interest of the population in the existence and creation of food products with anti-carcinogenic and antioxidant potential, to understand their beliefs in the field of nutrition in general.

### 3. Results and discussion

#### 3.1. Social Questions

As an introductory part, all respondents were asked to indicate their gender, age and occupation.



**Fig. 4.** Results of the respondents' analysis

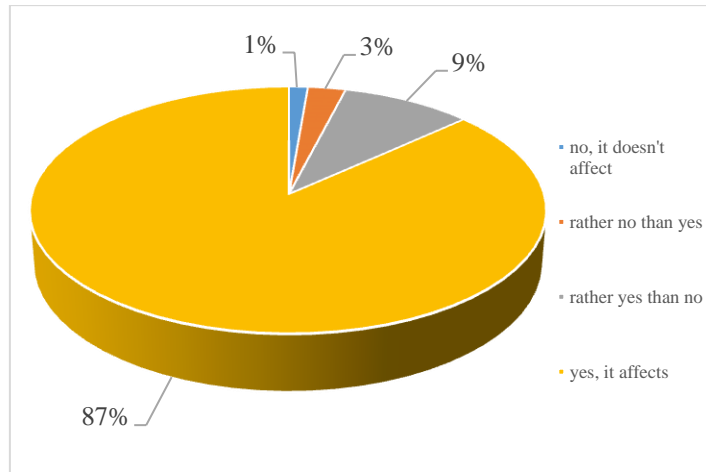
92 (61%) of the 150 respondents represent the female half of the population, 58 (39%) of the participants are men. The main percentage of respondents (51, 34%) belongs to the age group of 21-30 years, followed with a small difference by the age groups of 31-40 years (39, 26%), 41 and older (42, 28%). Young people under 20 were less interested in the topic under discussion (18, 12%).

More than half of the respondents (89, 59%) are engaged in labor activity, a significant number of students (48, 32%) also took part in the survey, there were only 4 participants among

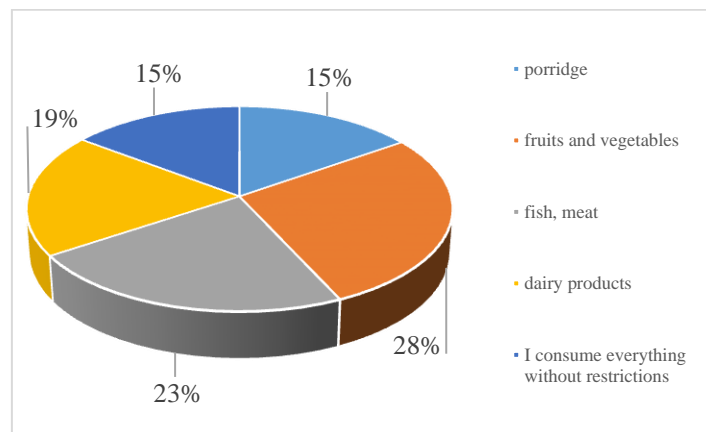
pensioners (3%), 1% (2) – mothers on maternity leave, 5% (7) – people, temporarily, without type of activity.

#### 3.2. Basic Questions

The analysis of the answers to the main questions asked to the respondents allowed to learn more about the nutrition of the population of the Republic of Moldova, to get acquainted with their opinion about functional foods, about their habits. The results are presented in the form of diagrams.



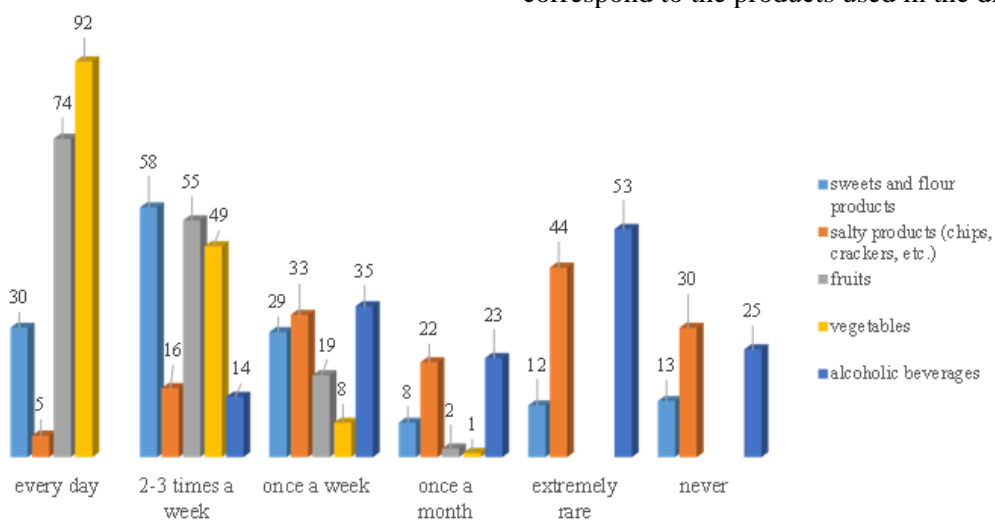
**Fig.5.** The results of the analysis of consumers' perception of the impact of food quality on health



**Fig. 6.** The results of the analysis of food groups that predominate in the diet of respondents

130 (87%) respondents see a relationship between the food consumed and its impact on the

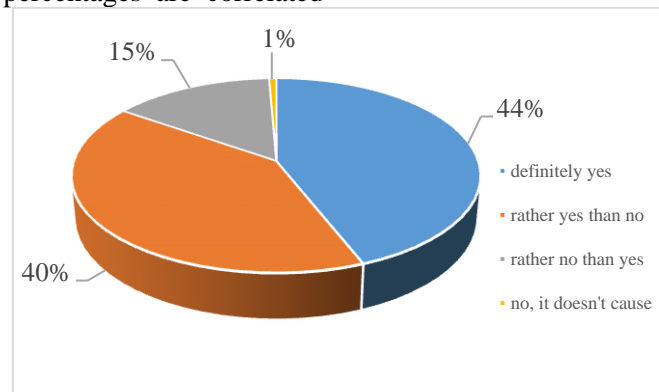
quality of health. However, their understanding of the importance of nutrition slightly does not correspond to the products used in the diet.



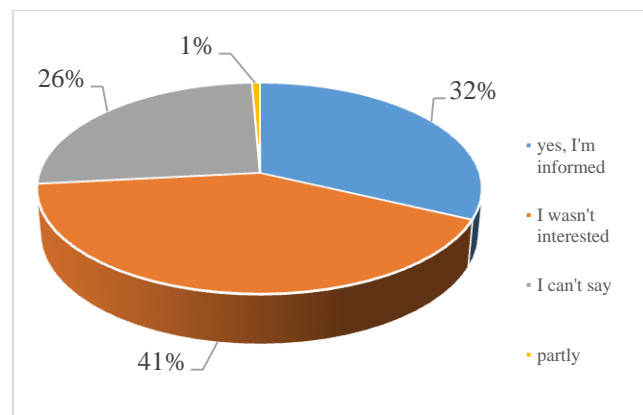
**Fig. 7.** The results of the analysis of the frequency of respondents' consumption of certain food groups

In general, from the respondents' answers, it can be concluded that they monitor their diet by including fish, meat, mostly fruits and vegetables, dairy products in the menu, nevertheless, out of 150 people, 30 consume flour and confectionery products daily. Within the framework of the survey, this value may not seem so impressive, since it is only 20% of all participants, if these percentages are correlated

with the entire population of the Republic of Moldova (2,597,107 people, according to statistics), then, presumably, 519,422 people include sweets in their diet every day, which leads to the appearance of overweight, and, subsequently, may cause the development of malignant neoplasms.



**Fig.8.** The results of the analysis of respondents' perception of the impact of nutrition on the development of oncological diseases



**Fig.9.** The results of the analysis of respondents' awareness of foods with antioxidant and anti-carcinogenic potential

The survey participants were asked whether they believe that food products lead to cancer, the results showed that 66 (44%) of respondents are confident that they do. 61 (40%) of respondents also believe that there is a relationship between nutrition and malignant formations, but this is not unambiguous, 22 (15%) people are more inclined to believe that nutrition does not have a direct effect on tumor development and only one person is sure that there is no relationship.

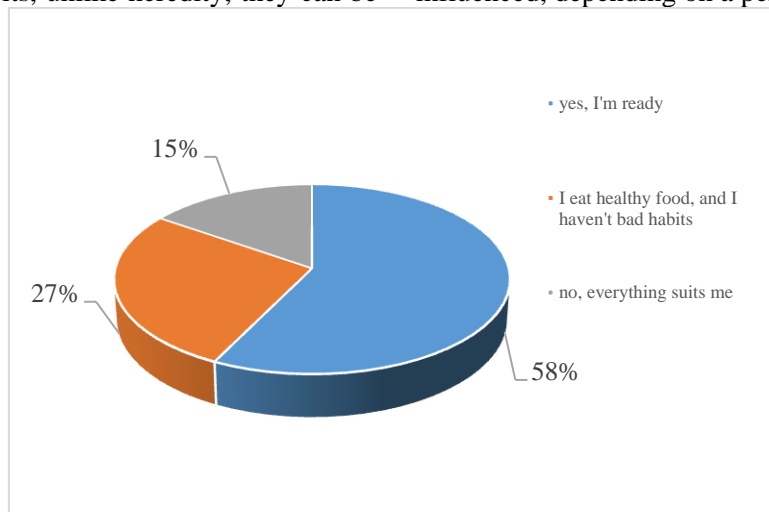
There is an extremely small number of autochthonous functional food products on the RM market, but the demand for them is growing. One of the reasons for the lack of a rich assortment of such a group of food products is

the lack of consumer awareness, from Figure 3.8. it can be noted that 62 (41%) of respondents are not familiar with FFP with antioxidant and anti-carcinogenic potential, 39 (26%) of participants doubt the answer, 1 (1%) - partially has no idea about such a group of products, and only 48 (32%) of the respondents are familiar with the FFP and understand their importance for the body.

### 3.3. Final Questions

With the exception of nutrition, the main factors affecting the development of cancer diseases also include smoking, alcohol, which

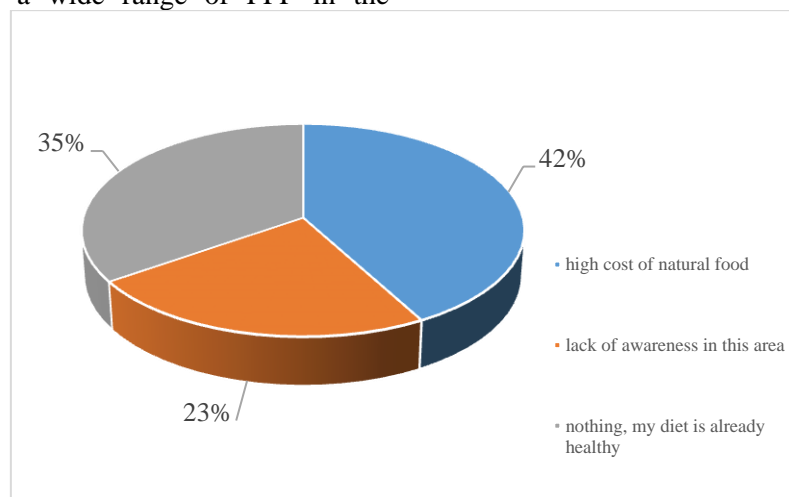
form harmful habits, unlike heredity, they can be influenced, depending on a person's desire.



**Fig. 10.** The results of the analysis of the level of willingness of respondents to give up bad habits

It can be noted that 86 (58%) of respondents are ready to give up their bad habits that cannot be combined with proper nutrition, 41 (27%) respondents are sure that their diet is balanced and they have nothing to give up, and 23 (15%) – answered that they do not want to change anything, since they are satisfied with everything. For a more detailed understanding of the reasons for the lack of a wide range of FPP in the

territory of the Republic of Moldova, participants were asked to indicate the main circumstances preventing their changes in the diet. According to statistics, the main factor for 63 (42%) of respondents is the high cost of natural products, 52 (35%) of respondents answered that they eat right, for 35 (23%) people, the hindering factor, as previously revealed, is insufficient awareness in this area.



**Fig.11.** The results of the analysis of factors that prevent proper nutrition

## Conclusions

As part of the study, a questionnaire was conducted among the population of the Republic of Moldova to analyze their perception of functional products with antioxidant and anti-carcinogenic potential. 150 respondents took part in the survey, 92 (61%) – representatives of the female half, 58 (39%) – men, whose age is

mainly (51, 34%) 21-30 years, followed by age groups of 31-40 years (39, 26%), 41 and older (42, 28%). Young people under 20 were less interested in the topic (18, 12%).

The survey revealed: 130 (87%) respondents believe that the quality of products has a direct impact on human health, causing diseases, including cancer. Also, analyzing the preferences of consumers in food and in the frequency of their consumption, the result was obtained that 30



respondents out of 150 consume sweets and flour products daily, which subsequently leads to the appearance of excess body weight, and then can lead to the development of cancer.

Insufficient awareness of functional foods with antioxidant and anti-carcinogenic potential, which is present in 62 (41%) of respondents, is one of the main factors hindering the observance of proper nutrition. Nevertheless, 111 respondents consider it important to obtain detailed information about nutrition for oncological diseases, about functional products in general, and also consider it necessary to expand the range of this group of products on the territory of the Republic of Moldova.

Detailed information about nutrition for oncological diseases and functional products in general is important for the respondents, and they also consider it necessary to expand the range of this group of products on the territory of the Republic of Moldova.

### Acknowledgments

The authors acknowledge the networking activities carried out within the Global Harmonization Initiative working group on “Consumer Perception” (<https://www.globalharmonization.net/wg-consumer-perception>) and especially “Innovative and Future Food Development” subgroup.

### References

1. Arai S (1996). *Studies on functional foods in Japan*. Bioscience Biotechnol Biochem 60, 9–15
2. Bagchi D (ed). (2008). *Neutraceutical and Functional Food Regulations*. Elsevier: New York
3. Baker Mathew T., LU Peng, Parrella Jean A., Leggette Holli R. *Consumer Acceptance toward Functional Foods: A Scoping Review*. USA, 22 January 2022. pp 40.
4. Birben Esra, Sahiner Umit Murat, Sackesen Cansin, Erzurum Serpil, KALAYCI Omer. *Oxidative Stress and Antioxidant Defense*. Ankara, January 2012. pp 9-19.
5. Halliwell Barry, Antonia Murcia M., Chirico Susanna, Aruoma Okezie I. *Free radicals and antioxidants in food and in vivo: What they do and how they work*. Texas, 09 January 2009. pp 5-20.
6. Hong Yeo-Jin, Kim Jeongseon, Lee Hye Yoon, Rim Chai Hong. *Nutrition Research and Practice. Development of the anti-cancer food scoring system 2.0: Validation and nutritional analyses of quantitative anti-cancer food scoring model*. Korea, 2020. pp 32-44.
7. Küster-Boludaa, I., Vidal-Capilla, I. *Article in Spanish journal of marketing – esic. Consumer attitudes in the election of functional foods*. Spain, 29 May 2017. pp 65-78.
8. Langseth Lillian. *Oxidants, antioxidants and disease prevention*. USA, 1995. pp 26.
9. Markovina Jerko, Cacic Jasna, Gajdoš Kljusurić Jasenka. *Young consumers' perception of functional foods in Croatia*. Croatia, 2 June 2014. pp 12.
10. Nazer Mohamad Reza, Ezati Parya, Akbari Mohsen. *Functional foods and their role in cancer prevention and health promotion: A comprehensive review*. Iran, 1 January 2019. pp 740-769.
11. Robu, E., Sergheeva, E., Popovici, C. *Consumer perceptions of functional foods with antioxidant and anticancer potential*. Book of abstracts of the International Conference “New Trends on Sensing-Monitoring-Telediagnosis for Life Sciences”, September 8-10, 2022, Braşov, Romania, 63 p.
12. Siddhita Tiwary, MD Sadique Hussain. *Research Letter. Functional foods for prevention and treatment of cancer*. India, March 2021. pp 10.
13. Topolska, K., Florkiewicz, A., Filipiak-Florkiewicz, A. *Functional Food—Consumer Motivations and Expectations*. Poland, 2021.
14. Urala, N., Schutz, H., Spinks, J. *Consumer Perceptions of “Functional Food” in the United States*. USA, 2011.
15. Vrgovic Petar, Pojic Milica, Teslic Nemanja, Mandica namarija, Cvetanovick Ljakic Aleksandra, Pavlic Branimir. *Communicating Function and Co-Creating Healthy Food: Designing a Functional Food Product Together with Consumers*. Serbia, 26 March 2021. pp 24.
16. WHO. International Agency for Research on Cancer. *Estimated number of deaths in 2020, all cancers*.
17. Young, I.S., Woodside, J.V. *Antioxidants in health and disease*. Publication 5 June 2000. UK. pp.176-184.