

## EVALUATION OF CONSUMER KNOWLEDGE, ATTITUDES AND PERCEPTIONS REGARDING ANTIOXIDANTS AND THEIR CONSUMPTION THROUGH MEAT PRODUCTS

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### Abstract

*As of recent times, consumers are starting to be more and more aware of the impact nutrition has over their health. The present study is based on the use of antioxidants and their consumption through meat products. In this sense, the study focused on using a survey to evaluate the consumers' understanding of what antioxidants are and their potential health benefits, their perceptions of the taste and quality of meat products that contain antioxidants, as well as their willingness to purchase such products. The survey showed that most consumers are aware of the potential harmful effect of long-time consumption of synthetic antioxidants. The surveyed people also stated that they consume meat and meat products almost on a daily basis; however most stated that they would not repurchase a meat product if the used natural antioxidant would cause changes in the product's colour and taste. As shown in the study, research methods such as surveys can provide valuable insights into consumers' attitudes and purchasing habits.*

**Key words:** antioxidants, meat, survey.

### INTRODUCTION

The use of preservatives in meat products, either natural or synthetic, represents a very important issue in the context of consumers' demand for safer and healthier products.

In this context, the use of plant-based antioxidants became more and more popular due to the fact that the consumers want to eat less processed food.

Previous studies have evaluated responses in different countries concerning food ingredients or additives (Aoki et al., 2010; Shim et al., 2011; Varela & Fiszman, 2013), chemicals in foods (Dickson-Spillmann et al., 2011) and food safety topics (Latorres et al., 2016; Miles et al., 2004; Ruby et al., 2019).

The conclusions of these studies showed that consumers are not able to understand the problem of food additives, due to their little

knowledge about the subject, although they are very concerned about additives and chemicals in their diet. Also, these studies revealed that there is a positive attitude towards using natural origin ingredients in all types of food, including meat products.

The present study focused on consumers' awareness of antioxidants use and their potential health benefits, perceptions of the taste and quality of meat products containing antioxidants, and the affordability of such products.

### MATERIALS AND METHODS

A cross-sectional survey based on a Google form questionnaire was conducted among the general population of Romania from September to November 2022. For this study, 605 adults from 5 macro-regions of Romania filled in the questionnaire.

The questionnaire included three parts with a total number of 27 questions regarding: 1. demographic characteristics, 2. assessment of general knowledge related to antioxidants, 3. consumers' attitude towards the consumption of meat products.

The first part of the questionnaire included questions about demographic characteristics such as gender, age, educational level, civil status, level of education and income. The second part included questions aimed to evaluate the Romanian population's general knowledge related to antioxidants, such as the types of antioxidants, the advantages and disadvantages of using natural antioxidants in meat products. The third part contained questions about consumers' attitude towards the consumption of meat products, such as the frequency of meat products consumption, the attitude of purchasing meat products based on the price and the ingredients used.

The participants filled in the questionnaire only in Romanian, with a period of about 10 minutes to complete.

Associations of respondents' personal details with the natural antioxidants and consumption of meat products-related traits of focus on this study were evaluated via logistic regression at a significance level threshold of  $p < 0.05$ . Independent variables included demographic traits: gender (male, female) and level of education (secondary, high school, graduate and postgraduate level).

## RESULTS AND DISCUSSIONS

### 1. Demographic characteristics

All the demographic data are presented in Table 1.

Analyzing the data it can be seen that 69.09% of the participants (n=418) were female and 30.91% were male. It can be observed that the percent of male respondents is substantially lower than the one for the females. The greater number of the participants, 68.09% (n=412) were young, aged between 18 and 24 years, meanwhile only 1.66% of the respondents was older than 64 years old. The tendency to participate in such questionnaires is higher for young people and it decreases progressively with age. Concerning the region, most of the respondents were from Muntenia 74.38%

(n=450) and the lowest rate in Banat 0.66% (n=4). Out of the participants, 62.31% (n=377) reported that their level of education is high school and 23.97% (n=145) were college graduates, whereas only 19.17% (n=116) were married and 37.35% earn less than 1500 lei monthly.

Table 1. Demographic parameters of the participants

Variable		N	%
Gender	female	418	69.09
	male	187	30.91
Age (years)	18-24	412	68.09
	25-34	75	12.39
	35-44	57	9.43
	45-54	39	6.45
	55-64	12	1.98
	≥64	10	1.66
Civil status	married	116	19.17
	in a relationship	274	45.29
	single	215	35.54
Region	Muntenia	450	74.38
	Moldova	69	11.40
	Transilvania	34	5.62
	Dobrogea	48	7.94
	Banat	4	0.66
Education level	secondary	3	0.50
	high school	377	62.31
	graduate	145	23.97
	postgraduate	80	13.22
Income	< 1500 lei (300 EUR) *	226	37.35
	1501-3000 lei (301-600EUR)	176	29.10
	3001-4500 lei (601-900 EUR)	101	16.70
	4500 lei (900 EUR)	102	16.85

\*Exchange rate: 1 EURO = 5 lei

### 2. Assessment of general knowledge related to antioxidants

The evaluation of general knowledge related to antioxidants was assessed in 9 questions (Table 2). In this part of the evaluation, the respondents were requested to answer different questions regarding the definition of antioxidants, the use of antioxidants in meat products and the negative aspects of using synthetic antioxidants in the human diet. General knowledge about antioxidants was considered satisfactory if more than 80% of the participants answered correctly for each statement.

More than a half of the respondents (60.33%) answered correctly to the statement "What does antioxidant mean?". A significant percent of the respondents (74.55%) believe that there are natural and synthetic antioxidants.

For the statement "Antioxidant substances are added to extend the shelf life of meat products",

the responses were 45.78% agree, 33.06% unsure and 21.16% disagree, which led us to the conclusion that more than half of the people are not aware of this aspect.

Table 2. Respondents' general knowledge related to antioxidants

Statement	Responses	%
What does antioxidant mean?	a substance that is added to food products to prevent spoilage	30.57
	compound that inhibits oxidation	60.33
	a substance added to food products to improve their colour, aroma and taste	9.10
Antioxidant substances are added to extend the shelf life of meat products	Agree	45.78
	Unsure	33.06
	Disagree	21.16
Do you think that the processing of meat foods affects the action of antioxidants?	Agree	44.62
	Unsure	37.85
	Disagree	17.53
Do you think that meat products that contain natural antioxidants are?	Bio	10.74
	Organic	20
	Natural	23.64
	Normal	46.62
There are natural antioxidants and synthetic antioxidants	Agree	74.55
	Unsure	21.65
	Disagree	3.80
Do you think that antioxidants also have negative effects?	Agree	37.20
	Unsure	20
	Disagree	8.09
	Some have	37.71
Synthetic antioxidants are harmful if they are consumed for a long time	Agree	58.18
	Unsure	35.86
	Disagree	5.96
Synthetic antioxidants consumed excessively cause allergies	Agree	47.10
	Unsure	49.26
	Disagree	3.64
The latest studies have shown that synthetic antioxidants consumed excessively and for a long time, cause the appearance of cancer. Do you know this aspect?	Agree	33.05
	Unsure	28.93
	Disagree	38.02

A similar pattern (44.62% agree, 37.85% unsure and 17.53% disagree) was observed for the question "Do you think that the processing of meat foods affects the action of antioxidants?".

A quite high percentage of 74.91% responded that all antioxidants (37.20%) or some of them (37.71%) have negative effects. More than 45% of the respondents agreed that synthetic antioxidants are harmful if they are consumed for a long period (58.18%) and also that they can cause allergy (47.10%). For the last question concerning the possibility of appearance of cancer, due to long term exposure to synthetic antioxidants, the responses were evenly distributed, 33.05% agree, 28.93% unsure and 38.02% disagree.

### 3. Consumers' attitude towards the consumption of meat products

This parameter was evaluated using 12 multiple response questions (Table 3).

Analyzing the data, it can be seen that the most frequently consumed type of meat according to this survey is chicken (56.52%), followed by pork 29.58%, meanwhile the least consumed is venison (0.17%). The most consumed meat products are the fresh ones (44.14%), while cooked smoked products, dried raw products and specialities had a similar percentage 18.67%, 18.35% and 18.84% respectively. Shops and supermarkets were considered the most reliable sources of acquisition for meat products (51.41%). Traditional products (44.63%) and conventional products (39.34%) were the most consumed meat products compared to ecological/ organic/ bio products with only 16.03%. For the question "How often do you eat meat and meat products?", 47.28% of the respondents answered 3-4 times a week, 36.69% daily, 13.06% once a week, 1.82% once a month and 1.15% never. The manufacturer (35.05%) and ingredients (30.09%) were considered to be the most important criteria for choosing a meat product. A high percentage of the respondents (76.53%) agreed with the fact that the price of the food product influences its quality. More than 83.63% of the respondents answered that they consume meat products with natural antioxidants. A percent of 57.36% and 79.67% would not consume a meat product if the natural antioxidant added to extend the shelf-life would change its colour or its taste respectively. A high number of respondents (n=457) would pay more for a meat product that contains only natural antioxidants.

Table 3. Respondents' attitude towards meat products consumption

Statement	Responses	%
Among the types of meat sold on the Romanian market, the most frequently consumed:	Beef	7.28
	Pork	29.58
	Mutton	1.66
	Chicken	56.52
	Venison	0.17
Among the meat products, which ones do you consume most frequently?	Fresh meat products (fresh sausages, hamburgers)	44.14
	Cooked smoked products (cabanos sausages, salami)	18.67
	Dried raw products (sausages, salami)	18.35
	Specialties (smoked short ribs, smoked tenderloin, smoked ham)	18.84
Among the meat suppliers, those who will inspire you the most confidence are	Individual sellers/producers certified by the manufacturer (home delivery or internet order)	23.31
	Markets/fairs dedicated to traditional products	18.84
	Markets, fairs, in general	6.44
	Shops or supermarkets	51.41
Among the meat products available on the market, which do you consume more frequently?	Conventional products	39.34
	Ecological/ organic/ bio products	16.03
	Traditional products	44.63
How often do you eat meat and meat products?	Daily	36.69
	3-4 times a week	47.28
	Once a week	13.06
	Once a month	1.82
	Never	1.15
Which is the most common criterion for choosing a meat product?	Manufacturer	35.05
	Appearance of the packaging	4.29
	Ingredients	30.09
	Price	13.05
	Lack of preservatives and synthetic colourings	11.57
	Recommendations from relatives	5.95
Do you consider that the price of the product influences the quality of a food product?	TV/radio/internet advertisements	No responses
	Agree	76.53
	Unsure	8.59
Do you consume meat products that contain natural antioxidants?	Disagree	14.88
	Yes	83.63
Would you still consume a meat product if the natural antioxidants added to extend the shelf life would change its colour?	No	16.37
	Yes	42.64
Would you still consume a meat product if the natural antioxidants added to extend the shelf life would change its taste?	Yes	57.36
	No	20.33

antioxidants added to extend the shelf life would change its taste?	No	79.67
Are you willing to pay more for a meat product that contains only natural antioxidants?	Yes	75.53
	No	24.47
Do you think that this information will influence the way you purchase meat products in the future?	Agree	57.68
	Unsure	33.23
	Disagree	9.09

The correlations between demographic information and different statements in the survey revealed different knowledge, perceptions and attitudes, mostly between gender and level of education.

For the question "Antioxidant substances are added to extend the shelf life of meat products" there were no significant differences between gender ( $p=0.940$ ), but there were significant differences by the level of education ( $p=0.001$ ). Also, for the question "Do you think that the processing of meat products affect the action of antioxidants?" there were no significant differences between gender ( $p=0.386$ ), but there were significant differences by the level of education ( $p=0.0051$ ). For the statement "Among the types of meat sold on the Romanian market, the most frequently consumed" there were significant differences between gender ( $p<0.0001$ ), but there were no significant by the level of education ( $p=0.089$ ). No significant differences were seen between gender ( $p=0.577$ ) and level of education ( $p=0.583$ ) regarding the consumption of distinct types of meat products. Regarding the consumers preferences, if there were sensorial modifications of colour and taste of meat products by adding natural antioxidants, significant differences could be observed, both by gender and level of education ( $p<0.05$ ).

## CONCLUSIONS

Our study shows that the knowledge of the general public in Romania regarding the use of natural antioxidants in meat products is quite low. A gratifying aspect is the fact that the majority of respondents consider long-term consumption of synthetic antioxidants has harmful effects on the human body, causing allergies or even cancer.

As a general conclusion, surveys are an important research tool in order to evaluate consumer knowledge, attitudes and perceptions in different fields of food safety.

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