GIDA
THE JOURNAL OF FOOD
E-ISSN 1309-6273, ISSN 1300-3070

Research / Araştırma
GIDA (2022) 47 (6) 1014-1031
doi: 10.15237/gida.GD22080

EVALUATION OF FACTORS AFFECTING CONSUMERS' POULTRY MEAT CONSUMPTION HABITS AND PERCEPTIONS AND POULTRY BREEDING PROCESSES

Guliz HASKARACA[1*], Yusuf ARSLAN[2], Zehra AYHAN[1]
[1]Sakarya University, Department of Food Engineering, Sakarya, Türkiye
[2]Sakarya University, Business School, Department of Business, Sakarya, Türkiye

Received /Geliş: 19.08.2022; *Accepted* /Kabul: 17.10.2022; *Published online* /Online baskı: 19.11.2022

Haskaraca, G., Arslan, Y., Ayhan, Z. (2022). Evaluation of factors affecting consumers' poultry meat consumption habits and perceptions and poultry breeding processes. GIDA (2022) 47 (6) 1014-1031 doi: 10.15237/ gida.GD22080

Haskaraca, G., Arslan, Y., Ayhan, Z. (2022). Tüketicilerin kanatlı eti tüketim alışkanlıklarını ve algısını etkileyen faktörlerin ve kanatlı hayvan yetiştirme süreçlerinin değerlendirilmesi. *GIDA* (2022) 47 (6) 1014-1031 doi: 10.15237/gida.GD22080

ABSTRACT
In this study, the evaluation of the factors affecting the consumers' perception and habits for poultry meat consumption; and the factors affecting the poultry breeding processes were investigated. For these purposes, consumer and breeder surveys were conducted with the attendance of 655 consumers and 323 producers from Turkey. Consumer survey focuses on purchasing habits, consumption preferences, the effects of the news on purchasing habits, and the false-facts about the poultry's washing, thawing, feeding, healing, and growing practices. In the breeder survey, breeders' opinion on feeding, healing, and growing in production processes, "*Salmonella* Control Program" and misleading news were analyzed. Findings showed that the frequency of poultry meat consumption varied significantly according to the demographic features. The expiration date was the most important factor that consumers paid attention to when purchasing poultry meat. Both the poultry sector and consumer preferences were affected by the misleading news published in the media. Packaging also played a significant role in purchasing habits.
Keywords: False facts, poultry consumption, speculations about poultry sector, consumer perception

TÜKETİCİLERİN KANATLI ETİ TÜKETİM ALIŞKANLIKLARINI VE ALGISINI ETKİLEYEN FAKTÖRLERİN VE KANATLI HAYVAN YETİŞTİRME SÜREÇLERİNİN DEĞERLENDİRİLMESİ

ÖZ
Bu çalışmada, tüketicilerin kanatlı eti tüketimine yönelik algı ve alışkanlıklarını etkileyen faktörlerin değerlendirilmesi ile kanatlı yetiştirme süreçlerine etki eden faktörler araştırılmıştır. Bu amaçla, Türkiye'den 655 tüketici ve 323 üreticinin katılımıyla tüketici ve yetiştirici anketleri yapılmıştır. Tüketici anketinde, satın alma alışkanlıklarına, tüketim tercihlerine, medyada yer alan haberlerin satın alma alışkanlıklarına etkilerine ve kanatlıların yıkama, çözündürme, beslenme, iyileştirme ve yetiştirme uygulamalarına ilişkin doğru bilinen yanlış bilgilere odaklanılmıştır. Yetiştirici anketinde ise

[*] *Corresponding author* / Yazışmalardan sorumlu yazar:
✉: gyaldirak@sakarya.edu.tr ✆: (+90) 264 295 54 54/ 5933 🖷: (+90) 264 295 56 01
Guliz HASKARACA; ORCID no: 0000-0002-4641-886X
Zehra AYHAN; ORCID no: 0000-0001-9114-4445
Yusuf ARSLAN; ORCID no: 0000-0002-1873-7567

yetiştiricilerin, üretim süreçlerinde beslenme, iyileştirme ve yetiştirme konuları ile "*Salmonella* Kontrol Programı" ve medyada yer alan yanıltıcı haberler hakkındaki görüşleri analiz edilmiştir. Bulgular, kanatlı eti tüketim sıklığının demografik özelliklere göre önemli ölçüde değiştiğini göstermiştir. Tüketicilerin kanatlı eti satın alırken dikkat ettikleri en önemli faktörün son kullanma tarihi olduğu belirlenmiştir. Basında çıkan yanıltıcı haberlerden hem kanatlı sektörünün hem de tüketici tercihlerinin etkilendiği gözlenmiştir. Tüketicilerin satın alma alışkanlıklarında ambalajın da önemli bir rol oynadığı tespit edilmiştir.
Anahtar kelimeler: Doğru bilinen yanlışlar, kanatlı tüketimi, kanatlı sektörü hakkındaki spekülasyonlar, tüketici algısı

INTRODUCTION

The poultry sector and poultry meat have great importance for both producers and consumers with some advantages. The examples of these advantages can be listed as reaching the weight of slaughter in a short time, not requiring much input for growth, ease of shelter, and year-round availability, for producers. And they can be listed as high bioavailability, easy access at all times, lower price (compared to red meat), good nutritional composition, and desirable taste for consumers. Besides, poultry meat is a good protein source for a healthy diet, with its highly digestible proteins (with low levels of collagen), unsaturated fatty acids, B-group vitamins (mainly thiamin, vitamin B6, and pantothenic acid), and minerals (like iron, zinc, and copper) (Petracci et al., 2014). Also, it suits the modern consumer demand for low-fat, healthy meat with its low sodium and cholesterol levels (Petracci et al., 2014). With these advantages and the increase in consumers' demand for healthier nutrition, the production and consumption of poultry meat have increased significantly in recent years (Popova, 2017). Until 2015, pork was the most consumed meat worldwide, but after 2015, poultry meat has become the most produced and consumed meat. Additionally, it was reported that, in 2018, while 15 million tons of small cattle meat (such as sheep and goat) were consumed all over the world, 72.3 million tons of cattle meat, 120.6 million tons of pork meat, and 121.6 million tons of poultry meat were produced. Moreover, in 2025, these numbers are expected to increase to 17.2, 75.5, 126.7, and 130.3 million tons for small cattle, cattle, pork, and poultry meat, respectively (Anonymous, 2017). On the other hand, poultry meat is one of the easily perishable products during logistics, distribution, and marketing if necessary conditions are not met. Therefore, consumers have a strong concern about the food safety of poultry meat and products. To reduce consumers' concerns about food safety, smart packaging methods began to be developed and used. This method contains different indicators/sensors that give an opinion about the product's freshness and real-time monitoring of quality and safety (Ahmad et al., 2018). These sensors provide information about the changes in the product or its environment by color or other visual changes.

Technology has been developing rapidly in the last century, and depending on this development, communication with the media has become effortless. While trustworthy news, reaching people through the media, raises people's awareness, inaccurate information published in these channels can cause people to be confused. Many people accept all the news they hear from social media as true, and do not investigate the accuracy of this news. Because of industrialization and the increase in poultry production values, the poultry sector has also been one of the most important and remarkable issues for the media. From time to time, true or false topics about the poultry sector occur in the media. For example, the issue of the "unhealthiness" of poultry meat production due to the short growth period of broilers is one of the issues that attract the attention of many people, as the media often bring it up.

This study aims to reveal the current status of the poultry market in terms of poultry meat consumption habits and poultry breeding processes by two different surveys, representing both consumers' and producers' perspectives. For this purpose, consumer attitudes and perceptions were evaluated based on the effects of poultry meat consumption habits, visual-written media

news, false facts on poultry meat, and smart packaging applications. Producers' perspective was analyzed considering different factors such as misleading news, growth process, feeding with GMOs, consumer attitudes, and curing with antibiotics on breeding processes.

MATERIALS AND METHODS

This study was conducted in two steps. The first step consists of a survey to measure consumer perceptions and purchase habits and how they are affected by misleading news. The second step consists of a survey to analyze the breeders' perspective and the effects of misleading information on poultry breeding processes in all types of media.

Consumer Survey

Both online and face-to-face methods were used for the data gathering processes. As the first step, an online survey was created using Google forms, and the questionnaire link was disseminated through the connections of the authors. Links were restricted, so they could not be accessed twice from the same IP. People who had the link were also asked to feel free to share it with their friends and family so that the sample would have maximum diversity. Additionally, face-to-face surveys were conducted with people who wanted to answer the survey. The same survey questions were used in the same order as the online survey. The collected data have been processed into google forms. The consumer survey was conducted between March and April 2019 in Turkey, with an attendance of a number of 655 usable questionnaires (53 were discarded due to inconsistency issues) over the age of 18. In total, 24 different questions consisting of multiple-choice questions, true/false questions, and ranking questions were asked to the participants. The questions were prepared in the direction to determine the consumer profile, white meat consumption habits of consumers, the effects of visual-written media news on their consumption, false facts on white meat, and to measure their perspectives on smart packaging. Table 1 shows an example of a consumer survey. The data gathered from a consumer survey were analyzed to conduct on chi-square analyses and to reveal the descriptive statistics using the IBM SPSS 20 statistic program (IBM Corp., 2011).

Breeder Survey

This second step evaluates the effects of various news in the media on breeders and their breeding processes and reveals the knowledge and opinions of breeders on chicken breeding processes. For these, an online survey was created using Google forms, and the results were collected online. The survey was conducted between March and April 2019 in Turkey, with the attendance of 323 poultry breeders. The breeder survey is given in Table 2. A total of nine questions consisting of both multiple-choice and open-ended questions were asked. Multiple-choice questions were analyzed using the Microsoft Excel program, and results were given as a percentage (%), while open-ended questions were collected and categorized in similar answers.

RESULTS

Consumer Survey

Demographic structure

The demographic structures of the participants of the consumer survey are given in Figure 1 (a-f). In total, 380 female and 275 male individuals participated in the consumer survey. It was observed that 24% of the individuals participating in the survey were married, and 76% were single. Among the surveyed people, most of the participants were between the ages 18-24 (63%), while 22%, 10%, 4%, and 1% of them were between the ages of 25-34, 35-44, 45-54, and 55 and above, respectively. As shown in Figure 1c, most of the surveyed participants have a bachelor's degree (79%). Education levels for other participants were determined as 11% high school, 5% master's and above, and 5% primary school. The distribution of income levels of surveyed individuals was determined as 18% for 0-800 Turkish Liras (TL), 13% for 801-1500 TL, 16% for 1501-2500 TL, 27% for 2501-4000 TL, and 26% for 4001 TL and above (Figure 1e) (1 Turkish Lira is approximately $5.68 in the year the study was conducted). It was observed that most of the individuals who participated in the survey consisted of families of 3 people (54%) and followed by families of 4 people (30%) (Figure 1f).

Table 1. Consumer survey questions

	Consumer survey questions
Demographic structure	Please select your gender
	Please select your age group
	Please select your educational status
	Please select your marital status
	Please write the number of individuals in the family
	Please select your monthly income
Questions	1. Do you consume poultry meat?
	2. How often do you consume white meat?
	3. Has your white meat consumption frequency changed in the last 5 years?
	4. Which part(s) of white meat do you consume the most? (multiple choice question)
	5. Where do you buy white meat? (multiple choice question)
	6. What is/are the reason for you to choose the place where you buy the white meat? (multiple choice question)
	7. Do you do your white meat shopping? (yes-no question)
	8. Evaluate the features you consider when purchasing white meat on a scale of 1 to 5. Properties: Expiry Date, Color, Smell, Economical, Healthy, Freshness, Fat Rate, Advertising Effect, Practical, Variety, Habit, Label Information, Accessibility (ranking question)
	9. Do your poultry meat consumption affected by the news about chicken meat published on TV, social media or newspapers? (yes-no question)
	10. Do you search whether these news on TV, social media or newspapers are true? (yes-no question)
	11. Which of the following information about white meat have you heard through visual/printed media? Which ones do you think are right or wrong? (D: True Y: False question) ☐ I use it by washing white meat because I think it gets cleaner. ☐ Frozen white meat can be thawed with hot water in case of emergency use. ☐ I think that white meat, which is difficult to cook and whose skin and flesh color is yellow, is organic. ☐ Excessive consumption of white meat causes early puberty. ☐ I think that in chicken production, hormones and/or antibiotics are used that threaten human health. ☐ I think that GMO feed is used in the feeding of chickens. ☐ I think that antibiotics used for therapeutic purposes in chicken production are passed to consumers through nutrition. ☐ I think that the meat of the free-range chicken is safer and more nutritious. ☐ I think the chickens grow faster by keeping the lights of the places they are on all the time. ☐ I think that animals are brought to consumption weight in a short time with the feeds used in feeding the chickens.
	12. Do you buy unpackaged white meat? (yes-no question)
	13. What are/are the elements you pay attention to when purchasing packaged white meat? (multiple choice question)
	14. Have you witnessed that the white meat you bought from the market is spoilt when you get home, even though it has valid expiration date? (yes-no question)
	15. Would you like to easily see if the product on the shelf is spoiled/deteriorated with a visual (color-transforming) indicator on the product package? (yes-no question)
	16. Do you think the use of a visual indicator indicating that the product is no more fresh increases the product reliability? (yes-no question)
	17. Even if the visual indicator used increases the price of the product, will you be willing to buy it? (yes-no question)
	18. Who/what source do you trust or consult about the quality and reliability of white meat? (multiple choice question)

Table 2. Breeder survey questions

Breeder survey questions
1) The growth process that chickens reach the slaughter weight in a short time, such as 45 days, is not perceived as a natural process by the consuers. Do you agree with this statement? (Yes- No question)
2) Do you agree with the statement that "chickens are left under light all night for rapid growth"? (Yes- No question)
3) How do the light sources/colors such as daylight, red and blue light application affect broiler eating habits and development? (Open ended question)
4) Are hormones used in poultry breeding? (Yes- No question)
5) Do you take consider the time of withdrawal from the body of the antibiotics before cutting broilers? (Yes- No question)
6) Do the feeds you use for raising chickens contain GMOs? (Yes- No question)
7) Do visual or written news published in the media about chicken breeding processes affect your sector If so, can you briefly mention the effects? (Both contains Yes- No and open ended answer)
8) Are there any attempts / actions you follow to eliminate the concerns of consumers? (Yes- No question)
9) Are you satisfied with the "*Salmonella* Control Program" followed by the Ministry? If not, what are your suggestions? (Both contains Yes- No and open ended answer)

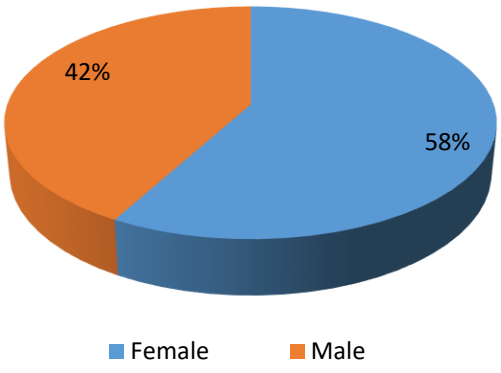

Figure 1a. Gender distribution of the consumer survey participants

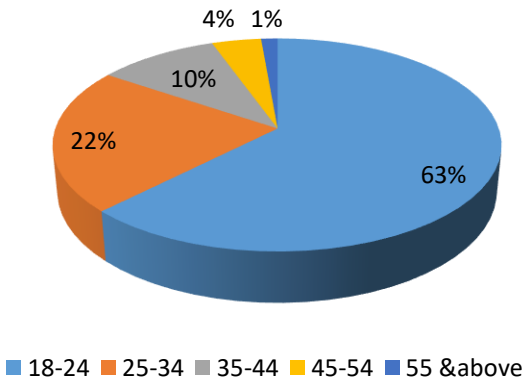

Figure 1b. Age distribution of the consumer survey participants

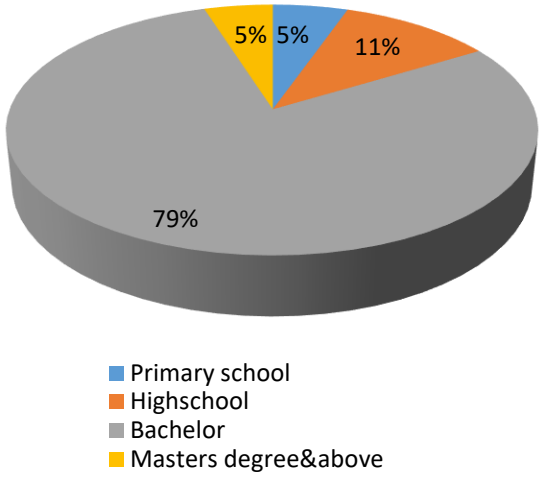

Figure 1c. Education levels of the consumer survey participants

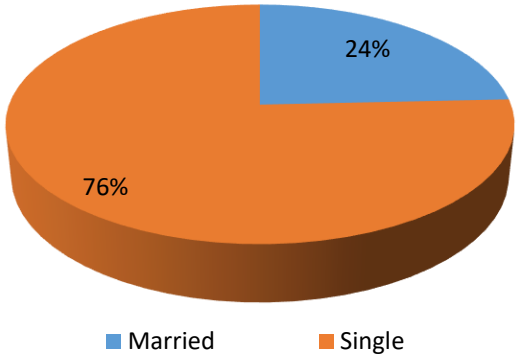

Figure 1d. Marital status of the consumer survey participants

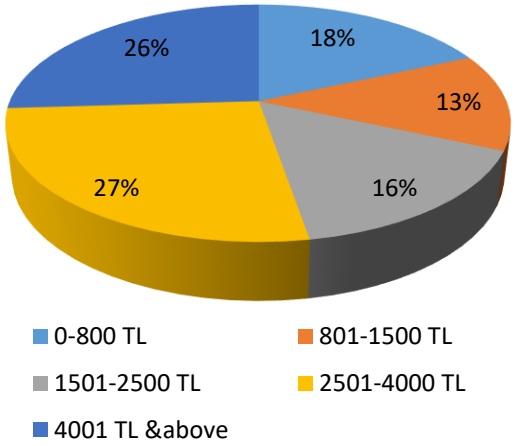

Figure 1e. Monthly incomes of the consumer survey participants

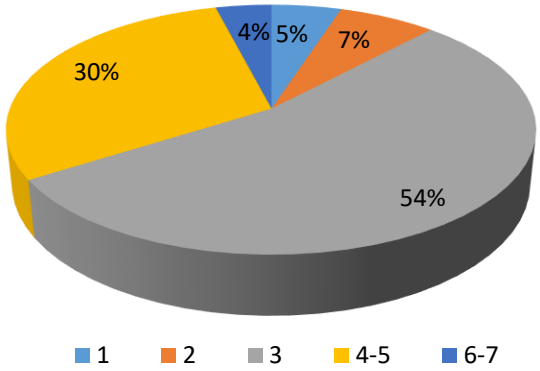

Figure 1f. Number of family members of the consumer survey participants

Figure 1. Demographic structure of the consumer survey participants

Poultry meat consumption habits

Among the surveyed 655 people, 98% of them consume poultry meat in their daily life, while 2% of them do not prefer to consume it for several reasons. These reasons can be listed as because; he/she does not like its taste, he/she is vegetarian, he/she found it unhealthy or unreliable, he/she thinks the chickens are adulterated, he/she has allergic to poultry meat, or he/she found it expensive. The poultry meat consumption frequency of surveyed participants was determined as 5%, 26%, 52%, and 17% for every day, 3-4 times a week, 1-2 times a week, and 1-2 times a month or less, respectively.

A Mann-Whitney U test was performed to reveal whether the frequency of poultry meat consumption differs according to gender. The findings indicated that the consumption of poultry meat varied significantly according to the gender of the participants ($U=42160.500$, $P<0.005$). Accordingly, the frequency of poultry meat consumption of female consumers is between 1-2 times a week to 3-4 times a week,

while for male consumers, it is between 3-4 times a week and every day.

Besides, to determine whether the frequency of poultry meat consumption varies with age, a Kruskal-Wallis test was conducted. The findings showed that the frequency of poultry meat consumption varied significantly according to the age group of the participants ($\chi2=64.004$, $P<0.05$). According to the post-hoc (Tamhane's T2) analysis performed to understand which groups are significantly different from each other, it was observed that participants in the 18-24 age group consumed significantly lower in quantity than the consumers in all other age groups ($P<0.001$ for all groups). Similarly, participants in the 25-34 age group consumed significantly less poultry meat than those in the 35-44 age group (mean difference= -0.324, $P=0.003$).

A Kruskal-Wallis test was conducted to reveal whether the frequency of poultry meat consumption varies according to the number of family members. The findings revealed that the frequency of poultry meat consumption did not differ significantly according to the number of family members of the participants ($\chi2=7.855$, $P>0.05$). The findings showed that the frequency of poultry meat consumption varied significantly according to the income level of the participants (Kruskal-Wallis test, $\chi2=16.618$, $P<0.05$). According to the results of the post-hoc (Tamhane's T2) analysis conducted to reveal the significant difference between groups, it is seen that participants with an income group of 0-800 TL consumed significantly less poultry meat than participants in the 2501-4000 income group (mean difference= -0.351, $P<0.05$).

The survey results showed that the most consumed poultry part was breast meat with 59% consumption rate, followed by the thigh (31%), wing (22%), whole poultry (21%), and other parts (4%). Markets (62%) are found to be the most preferred places in poultry meat shopping, followed by butchers (34%), farms (2%), and raised on their own (2%). It was observed that the most crucial parameter that participants pay attention to when choosing a place to purchase poultry meat is their trust in the place of sale and followed by cleanliness, closeness, product range, and price. While 42% of the participants generally do their shopping themselves, 21% do not do their shopping themselves, and 37% sometimes do their shopping themselves.

The participants were asked to determine the parameters they pay attention to while purchasing poultry, and they were asked to evaluate the given parameters from 1 (pay the least attention to) to 5 (pay the most attention to). The answers to this question are summarized in Table 3. According to the answers, expiration date (average 4.64 points) was found to be the most paid attention parameter while the effects of advertisements (average 2.50 points) were found the least paid attention parameter when purchasing poultry meat. Participants said that they pay less attention to advertising compared to other parameters such as expiration date, freshness, being healthy, smell, color, label information, availability, being economical, being practical, habit, fat rate, and product range.

Table 3. Evaluation of the parameters that are paid attention from most significant to least significant when purchasing poultry meat.

Evaluation Parameters	*Average scores**
Expiration date	4.64
Freshness	4.55
Being healthy	4.50
Smell	4.44
Color	4.25
Label information	3.93
Availability	3.87
Being economical	3.47
Being practical	3.47
Habit	3.47
Fat rate	3.46
Product range	3.46
Advertisement	2.50

* Scores were given from 1 (pay least attention to) to 5 (pay most attention to)

Forty-five percent of the participants reported that their poultry meat consumption was affected by the news about poultry meat published on TV, social media, magazines, or newspapers. In contrast, 55% reported that the news did not affect their poultry meat consumption. A substantial majority of the participants (43%) stated that they did not investigate the accuracy of the news about poultry meat published in the media. In comparison, 57% of them reported that they investigated their accuracy. In order to evaluate whether the consumers were affected by the news that frequently appeared in the media about poultry, a true or false question was also asked to the participants that involved some general statements about poultry meat took place in the media. The participants were asked to indicate true or false based on their up-to-date knowledge. These statements provided to the participants are given in Table 4. The answers to these statements are as follows:

-The vast majority of the participants (66%) reported that they wash poultry meat before cooking because they thought it gets cleaner,

-64% of them thought that it was a wrong practice to thaw frozen poultry in hot water in case of not enough time,

-46% of the participants thought that hard-cooked chicken with yellow skin and meat color is organic,

-69% of the participants thought excessive poultry meat consumption causes precocious puberty is a false statement.

-80% of the participants thought that hormones and/or antibiotics had been used in poultry breeding processes,

-89% of them thought that GMO feed had been used in the diet of chickens,

-74% of them thought that the antibiotic used for therapeutic purposes in chicken production is passed on to the consumers through nutrition,

-82% of them thought that the meat of the free-range chicken is safer and more nutritious compared to cage-free chickens,

-72% stated that the lights in the chicken coops were left on all day long, and thus the chickens were quickly raised,

-89% of them stated that the chickens were brought to the consumption weight in a short time by the effect of feed use in breeding.

Table 4. The percentages of participants choosing true or false statements of poultry meat published in the media

Poultry Related Statements That Takes Place in Media Organs	Answers of the participants (%)	
	True	*False*
I wash poultry meat because I think it gets cleaner.	66	34
Frozen poultry can be thawed in hot water in case of emergency use.	25	64
I think that hard-cooked chicken with yellow skin and meat color is organic.	46	54
Excessive consumption of poultry meat causes early puberty.	31	69
I think that hormones and/or antibiotics that threaten human health are used in chicken production.	80	20
I think GMO feed is used in the diet of chickens.	89	11
I think that the antibiotic used for therapeutic purposes in chicken production is passed on to consumers through nutrition.	74	26
I think the meat of the free-range chicken is safer and more nutritious comparing to cage-free chickens.	82	18
I think that the lights of the places where the chickens are located are kept on constantly so that they grow faster.	72	28
I think that with the feed used in the feeding of chickens, the chickens were brought to the consumption weight in a short time.	89	11

In the last five years, 41% of the participants reported that they did not change their poultry meat consumption frequency, while 22% decreased and 37% increased their poultry meat consumption frequency. It was determined that the group that said "my consumption of poultry meat has not changed in the last 5 years" gave a significantly more "no" answer to the question of "Do your poultry meat consumption affected by the news about chicken meat published on TV, social media or newspapers?" ($\chi2$= 12.824, P=0.02, df=2). When considering the relationship between the gender of the participants and their exposure to the news, a statistically significant difference was observed ($\chi2$= 12.753, P<0.05). According to this result, it can be said that female participants are significantly more affected by such news than male participants. In addition, there is a statistically significant relationship between the age of the participants and their status affected by the news ($\chi2$= 12.753, P<0.05). According to the z-test results, there was a significant difference between consumers in the 18-24 age group and those in the age groups between 25 and 55 (P<0.05). Participants between the ages of 25 and 55 are more affected by TV news (P<0.05). However, there is no statistically significant relationship between the education level of the participants and their situation regarding being affected by the news ($\chi2$= 3.918, P>0.05).

Participants were also asked which group they trust or consulted most issues related to the quality and reliability of poultry meat. The given groups and the answers of the participants are summarized in Table 5. Food engineers were found to be the most consulted group, followed by nutrition and dietetics specialists, medical doctors, internet sources, written or visual press news, veterinarians, and social media news.

Table 5. The most consulted and trusted professions on issues related to the quality and safety of poultry meat

OCCUPATIONAL GROUP	Answers (Number of Participants)
Food engineers	530
Nutrition and dietetics specialists	228
Medical doctors	129
Internet sources	102
Written or visual press news	83
Veterinarians	50
Social media news	41

Opinions on poultry meat packaging

Packaging is of great importance in ensuring and protecting food safety; thus, consumers were advised to take poultry meat in a package (Fang et al., 2017). Although most poultry meat and meat products take their place on the market shelves in different types of packages, they can be sold openly in the butcher's aisles. However, products sold without packaging can cause serious public health consequences. Therefore, to evaluate consumers' perceptions and preferences about the packaging of poultry meat, some questions were asked to the participants. Most of the participants (69%) reported that they never purchase poultry meat without packaging, while 13% of them prefer to buy unpacked poultry meat, and 18% said that it never minds packaged or unpackaged. There is a statistically significant relationship between the gender of the participants and the purchasing status of packaged poultry meat ($\chi2$= 7.287, P<0.05). When the gender of the participants was compared with regard to the packaged product consumption, it was observed that 275 of the

female and 177 of the male participants did not buy packaged poultry meat. According to this result, it can be said that male participants significantly purchased more packaged poultry meat than female participants.

The most attention-paid factors in the package were also asked participants in multiple-choice questions, and participants had a chance to choose more than one factor in this question. The factors given in this question are represented in Table 6. While purchasing packaged meat, "descriptive and sufficient label information" was found to be the most attention-paid result information, which was followed by product visibility, halal label, brand, and organic label. However, being one of the best-selling products, easy carrying/transport and the package design were observed as the less attention paid factors.

Table 6. The number of participants for the most significant information considered in the package label

Information	Answers (Number of Participants)
Having descriptive and sufficient label information	451
Product visibility	391
Halal label	346
Brand	313
Organic label	287
Being one of the best-selling products	71
Easy transportation	51
Package design	39

In daily life, sometimes people find that the poultry meat they buy from the market (or another selling point) is spoiled even if the expiration date has not passed. This situation causes economic losses for consumers, producers, and sellers. Also, it can damage the reliance of the consumers on the product. Nowadays, the same intelligent/smart packaging technologies have started to develop to prevent these losses. This technology gives the opportunity to consumers, producers, and sellers to follow the freshness of the product simultaneously. In this study, the consumers' perceptions regarding using smart packaging technologies in poultry packaging were also analyzed. Some participants (36%) reported that they have an experience with spoiled poultry meat product, although it has a valid expiration date. Although 89% of the participants reported that they would like to easily see if the product on the shelf is spoiled with a visual (by color-transforming) indicator on the package of the product, 3% of them reported that they do not want it, and 8% said they have no idea about it. There is a significant difference between the education groups in terms of the answers given to this question ($\chi 2$= 16.405, P=0.012, df=6). According to Tamhane's T2 test results, only the groups which have primary school degrees and master's and higher degrees are significantly different from each other in terms of their response to this question (Mean difference= 0.423, P=0.005), and participants with master's and higher degree are more open a smart label technology, which shows the freshness of the product.

To the question "Do you think the use of a visual smart indicator on the product indicating the product is not fresh anymore increases the product reliability?" 85% of participants said "yes" while 6% of them said "no" and 9% of them said "I have no idea" In addition, 66% of participants stated that they would buy smart labeled packages even if it increases the product's price. In contrast, 16% are unwilling to pay extra for the smart label, and 18% stated that they have no idea about it. A significant difference was

found between the income groups regarding responses given to this question ($\chi 2$= 15.860, *P*=0.044, df=8). According to Tamhane's T2 test results, the groups with the income of 801-1500 TL and more than 4001 TL (mean difference= 0.303, *P*= 0.46) and 1501-2500 TL and more than 4001 TL (mean difference= 0.290, *P*=0.034) are significantly different from each other. The group with the higher income is willing to pay more for smart packaging.

Breeder Survey

In the current study, a breeder survey was also conducted with the attendance of 323 breeders who has a breeding farm. Within the scope of this survey, it was aimed to get breeders' opinions about the accuracy of the news published in the media, to reveal the effects of misleading news on breeder processes, to learn their actions/attempts against that news, and to get breeders' opinion on consumers' poultry meat preferences and "*Salmonella* Control Program" ruled by the State.

Evaluation of growth period

Broilers are hybrid breeds with high meat yield, obtained by mating (hybridization) of the selection of breeds known as meat breeds through natural crossbreeding (Anonymous, 2014). As a result of long-lasting studies, "broiler" breed emerges as a species that comes to the weight of slaughter in as short as 45 days. It is thought that this new hybrid breed may not be well understood by some poultry breeders. Additionally, misleading news about broilers creates a perception of this species as if a new genetically modified breed has been discovered. To determine the breeders' perspective on this situation, a yes/no question was asked to breeders as "The growth process that chickens reach the slaughter weight in a short time, such as 45 days, is not perceived as a natural process by the consumers. Do you agree with this statement?" Three hundred and five of the 323 chicken breeders who participated in the study answered this question. 31.10% of the breeders who responded to this question stated that they agree with that statement indicating it is not a natural period. In comparison, 68.90% said they disagree with the statement indicating that it is the natural growth process.

Evaluation of the effects of lighting and light sources

To the question of "Do you agree with the statement that chickens are left under light all night for rapid growth?" Three hundred eight breeders responded. Among the responders, 46.80% agree that chickens are left under the light at night for rapid growth, while 53.20% disagree with this statement.

185 of the 323 chicken breeders answered the question of "How do the light sources/colors such as daylight, red and blue light application affect broiler eating habits and development?" This question was open-ended. The results obtained according to the answers received were categorized and compiled according to the following headings: effects on stress, effects on feed consumption, effects on broiler injury, effects on performance and yield increase, effects on bone development, effects on reproductive and growth hormones, and has no impact on broilers. Some breeders reported that they heard/know daylight, blue light, green light, and low light intensity calm broilers and reduce stress; however, high light intensity and red light make broilers angry and increase stress. Besides, some of them stated that they heard/know green light and daylight increase feed and water consumption, performance and yield, bone development, and production of reproductive and growth hormones. However, some of them emphasized that broilers that stay in the dark for a long time become famished during the dark period and attack the managers when they get light, and there may be injuries during this time. On the other hand, most breeders claim that different light sources do not affect broilers' feedings, growth, or reproduction. However, controlled light application is recommended (Lewis, 2009).

Evaluation of hormone usage

Ninety-five percent of the breeders reported that hormones are not used in broiler breeding; however, 5% said they use hormones.

Evaluation of the attention paid to the time of antibiotic withdrawal from the body before slaughter

Among the 323 breeders that participated in the survey, 311 breeders answered the question, "Do you consider the time of withdrawal from the body of the antibiotics before cutting broilers?" 98% of the responders reported that they pay attention to the time of withdrawal of the antibiotic from the broiler body before slaughter, while 2% did not.

Evaluation of the GMO contents of the feed used in broiler breeding

To the question "Do the feeds you use for raising chickens contain GMOs?" Three hundred four of the participants answered, and 46.40% reported that the feeds they use contain GMOs.

Evaluation of the effects of the news that publish in written or visual media on the poultry sector

There is a lot of misleading information about dietary habits and food production in the visual and print media. In order to assess the effects of news on the poultry sector, the question "Do visual or written news published in the media about chicken breeding processes affect your sector? If so, can you briefly mention the effects?" was asked the breeders. While 303 of the breeders answered this question, 87% stated that the news about the poultry affected the sector. Besides, 133 of them gave brief mentions, and they pointed out that the statements made by non-experts in the media, caused a serious misunderstanding. For example, because of false or inaccurate statements, consumers are losing their trust in the sector, they stop eating poultry meat. Thus they may stay away from an essential source of animal protein. In addition, the news about the use of antibiotics and hormones in poultry breeding brings a question mark to most consumers' minds, and therefore, they may avoid eating poultry meat. However, 50.80% of 301 breeders stated that there is an initiative/action to eliminate consumers' concerns that occur as a result of inappropriate/misleading news published in media, and 49.20% of them say that such an initiative/action does not exist.

Evaluation of the "Salmonella Control Program"

In developed countries, especially in the European Union countries, "National *Salmonella* Control Programs" are applied according to the appropriate sampling method at all stages of poultry breeding processes, from the first stage of production to reach the consumer. With the program, it is aimed that the frequency of *S. enteritidis* and *S. typhimurium* in poultry production will be below 1% in accordance with the appropriate sampling model according to European Union standards. After the studies conducted in this context, most European Union countries have reported that they have reached the target. In this monitoring, breeder flocks, commercial production poultry houses, slaughterhouses, and poultry products are used as material (Anonymous, 2018). In 2018, *"Salmonella* Control Program*"* was started to apply by the Republic of Turkey Ministry of Agriculture and Forestry to the poultry sector (started from hatcheries and breeder farms to the slaughterhouse). Within the scope of the breeder survey conducted in this study, the breeders were asked about their satisfaction with the "*Salmonella* Control Program" Seventy-nine percent of the 294 breeders responding to this question is satisfied with the *Salmonella* Control Program, while 21% are unsatisfied with this program. Forty-three of the chicken breeders who were unsatisfied with the *Salmonella* Control Program had some complaints and made suggestions to address these problems. These complaints can be categorized as non-effective and insufficient inspections, lack of necessary sensitivity and control in inspections, the dominant effect of integrated facilities. Some breeders pointed out that inspections should be done more effectively, temperately, tightly, and frequently.

DISCUSSION

Consumer Survey

According to the consumer survey, a significant difference was observed between income levels and the frequency of chicken meat consumption. As stated by Şengül et al. (2002), it has been determined that as families' income levels increase, the frequency of consumption of chicken meat and meat products also increases.

In the current study, the most consumed poultry part was breast (59%), while the consumption rate was only 21% for whole poultry. Similarly, in the survey studies carried out in Turkey by Şengül et al. (2002), Durmus et al. (2012), Kizilaslan and Nalinci (2013), and Eleroğlu et al. (2018), it is reported that 60%, 44%, 52%, and 44% of participants preferred to buy poultry meat as whole poultry, respectively. These rates were found to be much higher than our result. The decrease in whole chicken consumption may be due to the year differences between the studies or the age and income differences of the population surveyed.

Fresh poultry meat has a very short shelf life. Therefore, the expiration date was the most important factor that consumers paid attention to when purchasing poultry meat, followed by freshness (Table 3). Similarly, a study carried out by Durmuş et al. (2012) stated that the most crucial factor affecting the preference for fresh poultry meat is the expiration date (67.35%) which is followed by the brand (22.88%).

Although the advertisements were found the least affecting factor of consumer purchasing behavior, nearly half of the participants (45%) reported that their poultry meat consumption was affected by the news about poultry meat published on TV, social media, or newspapers. Up-to-date research indicated that advertisements, news, and information published in the mass media could have significant and measurable effects on consumer cognitions, emotions, and behaviors (Kemp et al., 2015; Vukmirovic, 2015; Pechmann and Catlin, 2016). These notifications show a significant positive association between exposure to food advertising and food choices (Vukmirovic, 2015). Misleading news and information are published in the media about poultry meat as an unhealthy food source due to hormone use, antibiotic use, keeping animals constantly in the daylight, etc. A substantial majority of the participants (43%) stated that they did not investigate the accuracy of the news about poultry meat published in the media. Thus, the accuracy of the news and information published in the media is of great importance, and the information of experts in the field should be published in the media more frequently.

On the other hand, with the information published in the mass media and personal justice, people create their consumption habits. Washing of raw meat is a widely applied mishandling practice among the public. Because during the washing of meat, several microorganisms found in washing water can contaminate the meat, or bacteria in raw poultry juices can be spread onto other foods, utensils, and surfaces (Henley et al., 2016; USDA-FSIS, 2020). Therefore, the washing process before cooking is not a highly recommended practice. However, 66% of the participants were reported that they wash poultry before cooking. There may be a suggestion on the labels to warn the consumer not to wash the raw meat before cooking.

Thawing of the perishable foods also needs extra attention because, during the thawing, the outer layer of the food could easily reach the danger zone, and the bacteria found on the surface of the food before could multiply rapidly. Thus, thawing of perishable foods such as poultry meat, thawing in the refrigerator, cold water, and microwave was recommended; however, thawing on the counter and in hot water was not recommended (USDA-FSIS, 2013). In the current study, it was observed that most of the participants know that it was a wrong practice thawing poultry meat in hot water (64%).

A vast majority of the participants (89%) thought that GMO feeds used in poultry breeding bring poultry to the cutting weight in a short time. Although GMO feeds can be used in poultry farming, but in the literature data, there is still speculation about whether it has adverse on humans. However, broilers are hybrid poultry formed by the crossbreeding of the most productive breeds. Thus, today broilers come to the cutting weight in approximately 42 days. So, this is not a result of their feeding. In addition, in the mass media, there is some news about the excessive consumption of poultry meat causes early puberty. Studies in the literature stated that

excessive consumption of poultry meat may and may not cause early puberty (Al-Agha et al., 2015; Chen et al., 2018; Subashree, 2020). However, there is not enough evidence stating the excessive consumption of poultry meat causes early puberty. In the current study, 69% of the surveyed people stated that they thought the excessive consumption of poultry meat could not cause early puberty; however, the rest thought it would.

On the other hand, there is also news about the usage of hormones and antibiotics in poultry breeding, and the mass media publish news about it periodically because this topic takes consumers' attention and media like to take their attention. Many poultry breeders try to explain that hormones are not used in breeding, that the use of hormones is not an economic practice, and that hormones are prohibited in many countries, including Turkey. But, still, the mass media publish the news about the use of hormones in breeding. In addition, antibiotics are used only in case of poultry disease, and veterinarians follow their elimination time before slaughter. However, 80% of the participants still believe that hormones and antibiotics have been used in poultry breeding processes. Although most (55%) of the participants reported that their purchasing habits were not affected by the news, it was observed that the news has important effects on their purchasing habits and their perceptions of 45%.

Packaging is important in poultry production and manufacturing because it protects the product from contamination by physical, chemical, and microbial risks. The current commercial application in poultry packaging is modified atmosphere packaging to increase the shelf life. However, it is highly desirable to apply new and innovative technologies called active and smart or intelligent packaging that will increase the shelf life of the product, give an idea about the freshness of the product, maximize meat quality and safety, and enhance customer engagement (Chowdhury and Morey, 2019) since the food loss is high due to very short shelf life of poultry meat products. The current study has also provided evidence that consumers have an interest and are willing to buy poultry products packaged with innovative technologies such as smart color indicators.

Breeder Survey

Broilers, a long-term study hybrid breed, can reach 2-2.5 kg slaughtering weight naturally by completing their development in 40-45 days by meeting their nutritional needs in a sufficient and balanced way and by being housed in a temperature and ventilation controlled and hygienic hen environment. Thus, breeders who are thought it is not a natural growth period for poultry should be informed/educated by the favor of written or visual media about broiler chickens and their production processes.

The effects of different lighting applications (different lighting times, different light colors, etc.) on poultry development have been studied in various studies in poultry farming (Wabeck and Skoglund, 1974; Yıldırım et al., 2009; Başer and Yetişir, 2010). Başer and Yetişir (2010) reported that different lighting programs applied in the breeder growing period regulate the daily rhythmic movements of the broilers, affect the access to food and water, and significantly affect the welfare level and yield performance of the animal. The study, evaluated the effects of different light treatments on mortality, body weight, weight gain, and feed consumption. Significant improvements were found in body weight, feed consumption, and body weight gain in green light or green-blue light-mixed groups. Additionally, significant improvements were determined in terms of carcass weight in the green or green-blue mixed group. It was recommended to apply green light for the first three weeks of the breeding period and green-blue mixed lighting for the remaining three weeks, especially for female broiler breeding (Başer and Yetişir, 2010).

Yıldırım et al. (2009) stated that the short lighting periods applied in the early period of breeding reduced the growth rate of broilers. Still, it was recovered in the form of compensatory growth in the later periods. It has also been stated that short lighting times improve feed conversion and reduce mortality. Besides, Wabeck and Skoglund

(1974) reported that the light spectrum affects the growth of broilers. They emphasized that broilers grown under blue or green light fluorescent lamps gained significantly more weight than broilers raised under red or white light, but feed yield and mortality were not affected by this factor.

As in many other European countries, the use of hormones in broiler breeding is prohibited in Turkey. Turkish Ministry of Agriculture and Forestry, General Directorate of Food and Control stated that it is not economical and feasible to give hormones to chickens, hormone application is not applied to ensure the rapid growth of chickens, and there is no hormone used for this purpose in chickens in our country and the world. Hormone use in poultry breeding in Turkey has not been encountered so far, and not a single case has been reported by authorized institutions (Anonymous, 2014).

From time to time, there are many false news about the use of antibiotics in the written and visual media, just like the use of hormones. As with humans, of course, antibiotics are used to heal animals. However, removing the antibiotic from the poultry body before slaughter is taken into account, and strict rules are applied by the Turkish Ministry of Agriculture and Forestry, General Directorate of Food and Control. As confirmed and reported by the breeders participating in the current survey, it was observed that breeders pay attention to the time of removal of the antibiotic from the broiler body before slaughter.

On the other hand, using GMO-containing feeds has been one of the most argued and taking attention topics by consumers. According to the statement made by the European Food Safety Authority (EFSA), it has been stated that no GMO DNA or proteins have been found in the tissues, fluids, and products of animals fed with GMO feeds (EFSA, 2007). Still, again, EFSA reported that the allergenicity of this new protein should continue to be assessed (EFSA, 2017). Consumers have serious concerns about the poultry meats that are fed with GMO-containing feeds. As the breeders' responses demonstrated, GMO feeds can be used in poultry breeding in Turkey. But the safety issues and permissions are evaluated by the Turkish Ministry of Agriculture and Forestry, Biosafety Council. The latest decisions of the Biosafety council have been published in the Official Gazette on January 23, 2021, which is responsible for determining the GMOs that can be used in our country and their areas of use. Accordingly, the approvals of 3 GMO soybeans, whose permit period expired on January 26, 2021, have been revoked. The use of 2 GMO soybean (305423 and FG72) and 1 GMO corn (MON 87427) varieties in feeds, which were previously applied for and are in the evaluation process, was approved (Anonymous, 2021).

Misleading information in the media occurs by exaggerating the effect of food, expressing functions that do not exist in food, and conveying that food is unhealthy or dangerous in an unscientific way (Sağlam and Gümüş, 2019). Breeders who participated in our survey reported that such news published in the media, whose source is unknown, undermines the trust in chicken meat and consumption of chicken meat. It was emphasized that the fabricated news, negatively affects not only the consumers but also the breeders. However, they stated that despite the news that had an instant impact, chicken meat consumption and production increased from year to year. This inconsistent situation may arise as a result of the increase in red meat prices and the necessity to meet animal protein needs. In order to prevent this information pollution presented in the media, it is critical to make a bridge between scientific facts and consumers to educate people for a better and healthier life.

The target of the "*Salmonella* Control Program" is to ensure that the frequency of *S. enteritidis* and *S. typhimurium* in broilers, layer hens, and turkeys is below 1%. For this purpose, environmental control, frequency of disinfection, and production period are important as the main factors to be controlled (Şahin and Öztap, 2018). With full compliance with the *Salmonella* Control Program, the *Salmonella* problem, an important problem in the poultry industry, will be solved. As relevant to "*Salmonella* Control Program" it was observed that most of the breeders are happy with

the application (79%). But, the rest of the breeders (21%) stated that there were points that they were not satisfied within the program. As mentioned in Part 3.2 under the subtitle of "Evaluation of the "*Salmonella* Control Program" breeders addressed some problems. For the dissatisfied breeders to be satisfied with the program, it has been observed that the ministry should conduct stricter and more effective inspections and that the samples must be taken objectively and by expert people.

CONCLUSION

Poultry meat is one of the most consumed meat products. Besides, 98% of the participants consumed poultry meat and a total 78% consumed it between 1 and 4 times a week. Trustworthiness was the most important parameter for choosing a purchasing place. Additionally, expiration date, freshness, and healthiness were other important parameters during shopping for poultry meat. Although more than half of the participants (55%) reported that they were not affected by the news published in the mass media, the rest (45%) was affected much more by the news, and this misleading information also affected the poultry sector adversely. Moreover, it has been observed that more awareness should be raised about poultry breeding among the breeders. According to the results, it was observed that there is no need to create a perception from scratch. But, still, there is a necessity to make arrangements in the existing system in order to reduce the number of unconscious breeders and consumers. It is predicted that to prevent wrong, insufficient/inadequate information and perceptions, correct information and instructions that can be supported by scientific data should be distributed to the public through visual and written media, educational programs, and prospectuses. It is also critical that taking part of the experts in these programs that the public can trust. In addition, most consumers were found open to the innovative process/packaging technologies in poultry packaging. Smart packaging applications will apparently reduce food loss, possibly due to inappropriate storage conditions, and prevent consumers from buying spoiled products still with valid expiration date saving their time and money.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

Güliz Haskaraca: Writing original draft, formal analysis, investigation, methodology, reviewing and editing; Yusuf Arslan: Statistical analysis, reviewing and editing; Zehra Ayhan: Writing original draft, methodology, reviewing and editing

ACKNOWLEDGEMENTS

We would like to thank to Betül Tekyildiz, Elif Kuru, Esra Çoban, Gamze Kurtoğlu for their support during conducting of the survey.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

Ahmed, I., Lin, H., Zou, L., Li, Z., Brody, A. L., Qazi, I. M., Lv, L., Pavase, T. R., Khan, M. U., Khan, S., Sun, L. (2018) An overview of smart packaging technologies for monitoring safety and quality of meat and meat products. *Packaging Technology and Science,* 31:7, 449-471.

Al-Agha, A. E., Saeedi, R. J., Tatwany, B. O. (2015) Correlation between Nutrition and Early Puberty in Girls Living in Jeddah, Saudi Arabia. *Journal of Women's Health Care*, 4, Article 233. doi:10.4172/2167-0420.1000233

Anonymous (2014) T.R. Ministry of Agriculture and Forestry, General Directorate of Food and Control, Misconceptions About Chicken Meat / T.C. Tarım ve Orman Bakanlığı Gıda ve Kontrol Genel Müdürlüğü, Piliç Eti Hakkında Doğru Bilinen Yanlışlar (In Turkish) Retrieved from https://www.tarimorman.gov.tr/GKGM/Duyuru/79/Pilic-Eti-Hakkinda-Dogru-Bilinen-Yanlislar, 2014. Accessed May 11, 2021

Anonymous (2017) Food outlook- November 2017 OECD-FAO Agricultural outlook 2018-2027. Retrieved from https://www.fao.org/

3/i9166e/i9166e_Chapter6_Meat.pdf Accessed May 11, 2021

Anonymous (2018) National *Salmonella* Control Program (in Turkish). Published by Republic of Turkey Ministry of Agriculture and Forestry, General Directorate of Food and Control, publish date: 16.2.2018. Retrieved from https://www.tarimorman.gov.tr/GKGM/Duyuru/323/Ulusal-Salmonella-Kontrol-Programi-Yayinlanmistir Accessed May 16, 2021

Anonymous (2021) Official Gazette dated 23 January 2021 and numbered 31373. Retrieved from https://www.resmigazete.gov.tr/ 23.01.2021 Accessed July 1, 2021.

Başer, E., Yetişir, R. (2010) Effects of Different Lighting Schedules on Broiler Performance and Welfare. *Animal Production/ Hayvansal Üretim*, 51(2), 68-76.

Chen C., Chen, Y., Zhang, Y., Sun, W., Jiang, Y., Song, Y., Zhu, Q., Mei, H., Wang, X., Liu, S., Jiang, F. (2018) Association between Dietary Patterns and Precocious Puberty in Children: A Population-Based Study. *International Journal of Endocrinology*, 4528704. doi: 10.1155/2018/ 4528704

Chowdhury, E.U., Morey, A. (2019) Intelligent Packaging for Poultry Industry. *Journal of Applied Poultry Research*, 28 (4): 791-800. https://doi.org/10.3382/japr/pfz098

Durmuş, İ., Mızrak, C., Kamanlı, S., Erdoğan Demirtaş, Ş., Kalebaşı, S., Karademir, E., Doğu, M. (2012). Poultry meat consumption and consumer trends in Turkey. *Bitlis Eren University Journal of Science and Technology*, 2, 10-14.

EFSA, (2007) EFSA statement on the fate of recombinant DNA or proteins in meat, milk and eggs from animals fed with GM feed. Retrieved from https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2007.744. Accessed July 1, 2021

EFSA, (2017) Guidance on allergenicity assessment of genetically modified plants. Retrieved from https://efsa.onlinelibrary.wiley.com/doi/full/10.2903/j.efsa.2017.4862. Accessed October 11, 2021

Eleroğlu, H., Bircan, H., Arslan, R. (2018) Yozgat İl Merkezinde Yumurta ve Tavuk eti Tüketimi Üzerine Etki Eden Faktörler/ The Factors Affecting Egg and Poultry Meat Consumption in Yozgat Province (in Turkish with English abstract). *Tavukçuluk Araştırma Dergisi*, 15 (1): 29-33.

Fang, Z., Zhao, Y., Warnera, R. D., Johnso, S. K. (2017) Active and intelligent packaging in meat industry. *Trends in Food Science and Technology*, 61, 60-71. http://dx.doi.org/10.1016/ j.tifs.2017.01.002

Henley, S. C., Gleason, J., Quinlan, J. J. (2016) Don't Wash Your Chicken!: A Food Safety Education Campaign to Address a Common Food Mishandling Practice. *Food Protection Trends*, 36(1), 43-53.

IBM Corp. (2011) IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.

Kemp, E., Bui, M., Chapa, S. (2015). The role of advertising in consumer emotion management. *International Journal of Advertising*, 31(2), 339-353. https://doi.org/10.2501/IJA-31-2-339-353

Kizilaslan, H., Nalinci, S. (2013) The poultry consumption habits of households and the factors affecting their poultry consumption in the province of Amasya. *Gaziosmanpaşa Journal of Scientific Research*, 6, 1-18.

Lewis, P. (2009) Lighting for Broiler Breeders. Aviagen. Retrieved from http://ar.staging.aviagen.com/ssets/Tech_Center/Broiler_Breeder_Tech_Articles/English/Lighting_for_Breeders.pdf. Accessed May 18, 2021.

Pechmann, C., Catlin, J. R. (2016) The effects of advertising and other marketing communications on health-related consumer behaviors. *Current Opinion in Psychology*, 10, 44-49. https://doi.org/ 10.1016/j.copsyc.2015.12.008

Petracci, M., Mudalal, S., Babini, E., Cavani, C. (2014) Effect of White Striping on Chemical Composition and Nutritional Value of Chicken Breast Meat. *Italian Journal of Animal Science*, 13:1. https://doi.org/10.4081/ijas.2014.3138

Popova, T. (2017) Effect of probiotics in poultry for improving meat quality. *Current Opinion in Food Science*, 14, 72-77. https://doi.org/10.1016/j.cofs.2017.01.008

Sağlam, K., Gümüş, T. (2019) The effects of food-related misconception in printed, visual and social media on the consumer. *GIDA*, 44:1, 153-162. https://doi.org/10.15237/gida.GD18108

Şahin, G., Öztap, G. (2018) Ulusal *Salmonella* Kontrol Programı. Oral presentation at the meeting of 6th Food Safety Congress, Istanbul, Turkey.

Şengül, A., Çelik, Y., Doğan, Z. (2002) Determination of Level of Chicken Meat Consumption and Consumption Pattern of Consumers in Şanlıurfa Urban Areas/ Şanlıurfa İli Kentsel Alanda Tavuk Eti Tüketim Düzeyi ve Tüketim Alışkanlıklarının Belirlenmesi (In Turkish). *Journal of Agricultural Faculty of Gaziosmanpaşa University (JAFAG),* 19(1), 145-150.

Subashree, A. (2020) Impact of poultry consumption by adolescent females – An analytical study. *Drug Invention Today*, 13(7), 1220-1223.

USDA-FSIS (2013) The Big Thaw - Safe Defrosting Methods. Retrieved from https://www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/food-safety-basics/big-thaw-safe-defrosting-methods. Accessed May 29, 2021

USDA-FSIS (2020) Washing Food: Does it Promote Food Safety? Retrieved from https://www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/food-safety-basics/washing-food-does-it-promote-food. Accessed May 29, 2021

Vukmirovic, M. (2015) The effects of food advertising on food-related behaviors and perceptions in adults: a review. *Food Research International*, 75, 13-19. https://doi.org/10.1016/j.foodres.2015.05.011

Wabeck, C. J., Skoglund, W. C. (1974) Influence of radiant energy from fluorescent light source on growth, mortality and feed conversion of broilers. *Poultry Science*, 53, 2055-2059. https://doi.org/10.3382/ps.0532055

Yıldırım, İ., Parlat, S.S., Tiryaki, S., Bülbül H. (2009) Effects of monochromatic illuminance from light emitting diodes (led) on broiler performance. *Selcuk University Journal of Agricultural and Food Sciences*, 23 (47): 73-76. ISSN: 1309-0550