NASE

Natural Sciences and Engineering Bulletin

November 2024, 1(2)
Received: 08/08/2024
Accepted: 09/10/2024

RESEARCH ARTICLE http://dergipark.gov.tr/nase

Understanding Consumer Preferences in Kahramanmaraş for Bulgur and Bulgur Products

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Keywords
Bulgur,
Fine bulgur,
Kahramanmaraş,
Packaging,
Consumer preference

Abstract – Bulgur and bulgur products may be sold and stored in bags composed of cloth or polymer, which exhibit disparate permeability and physical characteristics that could potentially impact the product. The products can be sold in bulk without individual packaging, directly from sacks or specific bulk storage, in accordance with customer requirements. The aim of the study was to evaluate preferred storage-packaging systems for bulgur and bulgur products by consumers in Kahramanmaraş region. In the region, some consumers produce their own bulgur at home instead of buying it from the market. Accordingly, an investigation of bulgur and its derivatives has been undertaken to ascertain consumer preferences with regard to home production, direct purchases from sacks, bulk purchases, and purchases of those already packed. These factors are important for the purpose of revealing bulgur consumption habits. The recommendations that can be drawn from the results obtained in this study are expected to contribute to the consumption and marketing of the bulgur. In addition, awareness was created of the preference for bulgur, fine bulgur, firik, and very fine bulgur and their importance in terms of health, packaging systems, and storage in Kahramanmaraş province. This survey was applied to 350 households in order to interview face-to-face with households living in the urban area of Kahramanmaraş province. The statistical examination of the data revealed that consumers lack sufficient information regarding the nutritional value of the products in question. Furthermore, it was evaluated that the effect of the packaging materials used for bulgur and bulgur products on the product properties, including shelf life, is not widely understood by consumers.

1. Introduction

Throughout human history, bulgur has been of great importance as a basic food source and different foods have been developed by processing with various methods. Studies on the processing of bulgur since the Stone Age show that bulgur may be one of the first processed foods in human history (Bayram, 2007; Bilgiçli and Soylu, 2016). In the Kahramanmaraş region, bulgur production is both a commercial and household practice, reflecting the area's deep-rooted agricultural traditions. Approximately 40% of the population still produces their own bulgur at home, while a significant portion opts for bulk purchases or pre-packaged bulgur, highlighting diverse consumption patterns in the region. This duality in production and consumption presents unique challenges and opportunities for manufacturers. For instance, local producers must balance between traditional bulk sales and modern packaging techniques that extend the products' shelf life, preserve their nutritional value, and meet consumer demand for convenience. Recent studies in the region have identified the need for innovation in bulgur packaging (Kasar et al., 2021; Kayaoğlu and Gülmez, 2022; Özbay et al., 2016). Most consumers prefer packaged bulgur due to its hygienic advantages and extended shelf life (Gupta et al., 2023; Sumiahadi et al., 2020).

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Citation: Şimşek, R. and Kaya, S. (2024). Understanding consumer preferences in Kahramanmaraş for bulgur and bulgur products. *Natural Sciences and Engineering Bulletin*, 1(2), 38-56.

However, some of the consumers prefer buying the products in bulk, even some of them producing their bulgur and its derivatives by themselves. The increasing awareness of health and nutritional benefits linked to bulgur consumption also suggests that there is a rising demand for improved packaging solutions that better cater to consumer health-consciousness. Bulgur is a highly nutritious cereal product rich in several key nutrients. It contains a high amount of fiber, which supports digestive health, and is an excellent source of complex carbohydrates that provide sustained energy (Dönmez et al., 2004). Additionally, bulgur is rich in B vitamins (especially B1 and folate), which are important for energy metabolism and nervous system health (Özbay et al., 2016). It also contains essential minerals like magnesium, iron, potassium, and phosphorus, which contribute to bone health, blood pressure regulation, and muscle function (Michel and Bayram, 2024). Its general composition includes 9-13% water, 10-16% protein, 1.2-1.5% fat, 76-78% carbohydrate, 1.2-1.4% ash and 1.1-1.3% fiber. In addition, it has higher values in terms of nutrients such as protein, calcium, iron, vitamin B1 and niacin compared to other cereal products such as bread and pasta (Saad et al., 2018). Bulgur is a product produced by cleaning, cooking, drying and grinding bulgur to certain sizes and has the ability to be stored for a long time due to the inactivation of enzymes during the cooking process (Belibağlı et al., 2009). Bulgur is known as a staple food widely used especially in Middle Eastern and Mediterranean cuisines. Fine bulgur is smaller in size than bulgur and represents the smallest size of the yellow bulgur varieties except very fine bulgur, but very fine bulgur is also not cooked during production. Fine bulgur is rich in fiber, vegetable protein, minerals and vitamins (Michel and Bayram, 2024). Firik is a traditional product obtained by roasting wheat in the milk stage with fire and has a green brown color and a sooty aroma, these characteristics are considered as quality parameters of firik (Yılmaz and Yıldırım, 2020). Figure 1 shows main wheat derivatives, bulgur, fine bulgur, dövme and firik. Effective packaging is essential to preserve the quality and extend the shelf life of bulgur products. Packaging needs and storage conditions of bulgur and bulgur products are given in Table 1. The sensitivity of these products to moisture, oxygen and light requires the selection of appropriate packaging materials (Sumiahadi et al., 2020; Xie, 2017). Inappropriate storage conditions can lead to mold, oxidation, and loss of nutritional value. This study aims to assess the level of knowledge of local people about the packaging and storage conditions of bulgur and fine bulgur in Kahramanmaraş region, to examine the effects of the materials used in the packaging of these products on product quality and to analyze data on consumer preferences. The objective of this study is to ascertain the extent of knowledge held by the local population in the Kahramanmaraş region with regard to the packaging and storage of bulgur and related products. Furthermore, this study seeks to identify consumer preferences for purchasing these products with or without packaging, as well as to determine which types of packaging options are preferred. Furthermore, the relationship between consumer characteristics, including age, gender, education level, income level, and demographic and socioeconomic status, and consumption of bulgur and bulgur products was examined. The study also investigated which traditional foods are most commonly prepared with bulgur and its derivatives.

Table 1. Summary table of bulgur and fine bulgur packaging and storage conditions.

Product	Packaging Material	Storage Conditions*	Labeling Details
Bulgur	Food-grade plastic/paper bags or containers	Cool, dry place (15-25°C), low humidity*1, protect from direct sunlight*2	Product name, packaging date, expiration date, storage instructions
Fine bulgur	Food-grade plastic/paper bags or containers	Cool, dry place (15-25°C), low humidity*1, protect from direct sunlight*2	Product name, packaging date, expiration date, storage instructions

*1from a label of a related product pack, *2Sumiahadi, et al., 2020

BULGUR **FINE BULGUR** **DÖVME** **FİRİK**

Figure 1. Visual presentation of some wheat derivatives

2. Methodology

This study was conducted in order to determine the consumption habits of bulgur and bulgur products of consumers residing in the urban area of Kahramanmaraş. In addition to the local people living in the Kahramanmaraş region, workers working in various factories in the Organized Industrial Zone (OIZ) were also included in the research. Data collection was conducted through face-to-face surveys between March 2024 and April 2024. The study consists of a total of 350 people living in the urban area of Kahramanmaraş province. In the selection of the respondents, the location of Kahramanmaraş province in the Mediterranean region was taken into account, ensuring a general representativeness in terms of income and educational status of the region. In the questionnaire form, questions were included to determine the consumption levels of these products of the participants and their level of knowledge about the packaging methods of them. In addition, demographic information such as gender, age, education level, occupation, number of people in the household, and income level was also collected. The reason for choosing this method is to determine the level of knowledge of local people about the packaging and storage of bulgur and bulgur products in the most accurate way, to understand the reasons for the preference of these products and to analyze the demographic and socioeconomic factors behind these preferences in detail. Face-to-face interviews increase the reliability of the results by providing a better understanding of the survey questions and enabling respondents to provide more reliable data. In the study, the confidentiality and anonymity of the participants were protected during data collection and analysis. The participants were informed that the information they provided would only be used for academic purposes and that their personal information would be kept confidential. In addition, the participants were voluntarily included in the study and no pressure or coercion was applied. During data collection, all procedures were carried out in accordance with the rules of academic ethics and the rights of the participants were respected. The data obtained were analyzed using statistical evaluation methods. These analyses include detailed evaluations of the reasons for the preference for bulgur and fine bulgur, factors affecting consumption, nutritional content, packaging, and storage. In line with the results of the research, deficiencies in the level of public knowledge on bulgur and fine bulgur packaging and storage were identified and it was aimed to raise awareness on this issue.

In this study, a 44-question survey was used to assess the knowledge of consumers living in the urban area of Kahramanmaraş on the packaging and storage of bulgur and fine bulgur, as well as to gather data on their preferences, consumption factors, and nutritional awareness, providing a quick and economical method to evaluate attitudes, behaviors, and opinions on these topics.

2.1. Survey structure

The survey questions were structured with classification and ranking scales. Closed-ended questions were used to ensure that respondents provided their answers within predetermined categories. These categories were organized as simple binary options (e.g. 'yes' or 'no', 'male' or 'female') or more complex lists of alternatives from which respondents could choose. Closed-ended questions provided nominal and ordinal data, allowing the data to be analyzed systematically (Gökkaya Erdem et al., 2023).

2.2. Sampling and data collection process

The study sample consisted of individuals living in the urban area of Kahramanmaraş province who agreed to participate in the research. Sample selection was randomized, and data were collected through face-to-face surveys at the OIZ. The inclusion criteria included individuals residing in the Kahramanmaraş region who

accepted the survey, while the exclusion criteria included factors such as not consuming cereal products, general health status, and age.

2.3. Data analysis

The collected data were analyzed using the free trial version of SPSS (Statistical Package for Social Sciences) for Windows 25.0 software. Descriptive statistical methods (number, percentage) were used to evaluate the data. The relationships between variables were analyzed by the Chi-square test. The chi-square test has been chosen because it is more appropriate for analyzing categorical data, does not assume a normal distribution, and is more flexible regarding the assumptions about the data, making it suitable for scenarios where parametric tests may not be applicable. Statistical analyses were performed at a 95% confidence interval, and the significance level was accepted as 0.05. This methodology allowed the analysis of consumer preferences and knowledge levels on bulgur and fine bulgur consumption, packaging, and storage in accordance with the objectives of the study.

3. Results and Discussion

3.1. Demographic characteristics of consumers

The study surveyed 350 households in the urban area of Kahramanmaraş to understand their consumption habits of bulgur and bulgur products. The survey sample of 350 respondents may not be fully representative of the entire Kahramanmaraş region. However, it provides meaningful insights into consumer preferences in urban areas. Future studies could focus on more specific areas, such as industrial zones or universities, to obtain results that are more representative of these particular communities. Table 2 summarizes the demographic characteristics of the participants. The majority of the respondents were young to middle-aged adults, with 54.3% being female and 51.7 % being married. In terms of education, 35.7% of respondents held undergraduate degrees, while 31.7% were high school graduates. Most of the participants were employed (50.6%), while 18% were students. In terms of household size, 67.7% of the participants lived in families with 3-5 members, and 17.1% lived in households with 6-7 members. Family income distribution varied, with 33.4% of households earning between 17,000 TL and 30,000 TL per month and 23.7% earning below 17,000 TL. For future readers to accurately assess the monetary amounts mentioned in this section, it is important to provide context regarding the minimum wage at the time of writing. As of 2024, the minimum wage in Turkey was 17,002 TL per month. This wage serves as a benchmark for understanding income brackets within the study. For instance, households earning below 17,000 TL per month are likely earning close to or slightly above the minimum wage, whereas those in higher income brackets (above 30,000 TL) represent the middle and upper-income segments. This context helps assess the economic standing of participants in relation to their consumption behaviors and purchasing power. The data on income levels in this region directly influences consumer preferences, especially in terms of the types of bulgur products they purchase. Higher-income consumers tend to prefer packaged products for their convenience and perceived hygiene, while lower-income households are more likely to purchase in bulk or produce bulgur at home. Bulgur and fine bulgur hold a significant place in the diets of many urban populations in Turkey, including Kahramanmaraş, where these products are a staple due to their affordability, ease of preparation, and versatility (Dönmez et al., 2004). Studies show that demographic factors such as income, education, and household size influence the consumption patterns of bulgur. For example, households with lower income and larger family sizes tend to consume bulgur more frequently due to its cost-effectiveness and high nutritional value (Kayaoğlu and Gülmez, 2022). Bulgur, particularly fine bulgur, is commonly used in dishes like *kısır* (a bulgur-based salad) and *raw köfte*, where its light texture and fast preparation are appreciated. It can be soaked rather than cooked, making it an accessible and convenient ingredient for many. Moreover, bulgur's high fiber content and lower glycemic index compared to rice and pasta make it a popular choice among health-conscious consumers (Tekin-Çakmak et al., 2024). For companies aiming to develop marketing strategies around bulgur, understanding these consumption patterns and demographic factors provides essential insights. Marketing efforts could emphasize its health benefits, convenience, and versatility to appeal to a broad range of consumers across various socioeconomic segments (Kayaoğlu and Gülmez, 2022).

Table 2. Participants' descriptive information

		Number	%
Age	25 and below	118	33.7
	26-35	110	31.4
	36-45	65	18.6
	46+	57	16.3
Gender	Male	160	45.7
	Female	190	54.3
Marital Status	Single	169	48.3
	Married	181	51.7
Education Status	Primary school	53	15.1
	High school	111	31.7
	Associate Degree	39	11.1
	License	125	35.7
	Master Degree/PhD	22	6.3
Employment Status	Employed	177	50.6
	Not employed	59	16.9
	Stay-at-home parent	46	13.1
	Student	63	18.0
	Other	5	1.4
Number of family members	1-2	39	11.1
	3-5	237	67.7
	6-7	60	17.1
	8-10	11	3.1
	10+	3	0.9
Monthly family income (as of 2024, min wage is 17,002 TL)	< 17.000TL	83	23.7
	17,000 TL- 30,000TL	117	33.4
	30,000 TL- 45,000 TL	70	20.0
	45,000 TL- 60,000 TL	36	10.3
	> 60,000 TL	44	12.6
Consumption Frequency	I consume every day	73	20.9
	I consume one day a week	186	53.1
	I consume it every fifteen days	53	15.1
	I consume it once a month	38	10.9

3.2. Consumption methods of consumers for wheat derivatives

Table 3 shows the consumption preferences of consumers living in the urban area of Kahramanmaraş province for wheat derivatives, especially bulgur and fine bulgur, and the dishes made from these products. The data reveals that bulgur is the most preferred wheat derivative among consumers in the region. While 78.6% of the respondents stated that they consume bulgur the most, 21.4% stated that they prefer fine bulgur. It was observed that bulgur is a widely consumed food in Kahramanmaraş and is frequently used in traditional dishes, especially in rural areas. Among the participants who preferred bulgur, the most popular dish was infertile, with a rate of 50.9%. This was followed by stuffed (içli) köfte at 28.0%, bulgur soup at 13.8%, and plain bulgur pilaf at 13.1%. Among the participants who preferred fine bulgur, the most consumed food was raw köfte with 42.6%, followed by fine bulgur köfte with 41.3%. These results show that fine bulgur is mostly used in local and special dishes. Participants who preferred pounded bulgur preferred traditional dishes such as plain pounded pilaf (20.2%) and aşure (4.1%). This shows that pounded bulgur is used especially in certain types of dishes and has an important place in traditional cuisine. Among the respondents who preferred firik, the most popular dish was firik pilaf (78.5%). Firik is also used in making tarhana (49.4%) and soup (15.2%). Firik is not known like other wheat derivatives, but it stands out as a food with high nutritional value. In conclusion, wheat derivatives are widely consumed in the urban area of Kahramanmaraş province, especially bulgur, which is used in various dishes. These findings show that bulgur and fine bulgur have an important place in the local cuisine and that the consumption habits of these products are closely related to the nutritional culture of the people of the region.

Table 3. Distribution of participants' consumption preference for wheat derivatives

		Number	%
Which of the wheat derivatives, bulgur, and its products, do you consume the most?	Fine bulgur	75	21.4
	Bulgur	275	78.6
Apart from bulgur and its products, do you consume the most?	Very fine bulgur	28	8.0
	Dövme	243	69.4
	Firik	79	22.6
Please examine the listed dishes (including mainly bulgur) and indicate your preference (n=275)	Plain bulgur pilaf	36	13.1
	Bulgur pilaf with vegetables	28	10.2
	Pilaf with meat	9	3.3
	Soup	38	13.8
	Analı kızlı köfte	11	4.0
	Köfte with sour	20	7.2
	Sömelek köfte	21	7.6
	Yağlama	2	0.7
	Kısır	140	50.9
	Sarma/Dolma	11	4.0
	Mumbar	3	1.1
	Stuffed(İçli) köfte	77	28.0
Please examine the listed dishes (including mainly fine bulgur) and indicate your preference (n=75)	Fine bulgur köfte	31	41.3
	Lentil köfte	19	25.3
	Fellah köfte	9	12.0
	Batırık köfte	1	1.3
	Raw köfte	32	42.6
Please examine the listed dishes (including mainly dövme) and indicate your preference (n=243)	Plain dövme rice	49	20.2
	Dövme rice with vegetables	3	1.2
	Soup	9	3.7
	Dövme soup with yogurt	8	3.3
	Dövme aşı	3	1.2
	Aşure	10	4.1
Please examine the listed dishes (including mainly firik) and indicate your preference (n=79)	Pilaf	62	78.5
	Tarhana	39	49.4
	Soup	12	15.2
Please examine the listed dishes (including mainly very fine bulgur) and indicate your preference (n=28)	Fine bulgur köfte	28	100.0

3.3. Consumption preferences of consumers

This study examined the reasons why consumers living in urban areas of Kahramanmaraş province prefer bulgur derivatives such as bulgur and fine bulgur. The data obtained show that the majority of the participants (82.6%) prefer these products because they find them nutritious and satisfying. In addition, 84.6% of the participants stated that they consume dishes made from bulgur derivatives because they find them delicious. Furthermore, 75.1% of the participants reported that they prefer these products because they can be stored for a long time without spoiling. This is consistent with previous findings that highlight bulgur's long shelf life and minimal need for preservatives, making it a durable food choice for households. Moreover, 80.6% emphasized that they prefer these products for their health benefits, a sentiment echoed by studies showing that bulgur is rich in fiber, protein, and essential nutrients. A previous study by Bayram (2007) found that Turkish consumers' preference for bulgur is also driven by its versatile use in both daily meals and traditional dishes. These findings, which align with our results, confirm that bulgur holds a significant place in Turkish cuisine, particularly in

Kahramanmaraş, where both traditional and modern consumption patterns coexist. In conclusion, our findings reaffirm that bulgur and similar products are widely preferred in Kahramanmaraş due to their nutritional value, durability, and health benefits. These preferences are consistent with broader trends observed in Turkish bulgur consumption studies. The strong cultural and practical reasons for the preference for these products make them integral to the local diet, highlighting the potential for further studies to explore how modern packaging methods could enhance their appeal and marketability. Recent research in Turkey highlights the increasing consumer demand for health-conscious and sustainably packaged products. For example, a study by Kayaoğlu and Gülmez (2022) indicates that Turkish consumers are becoming more mindful of packaging materials and their impact on product quality and safety. This aligns with the findings of this study, which underscores the growing importance of packaging in influencing consumer choices, particularly for staple foods like bulgur. Another similar study was conducted by Özbay et al. (2016); they examined the consumption of bulgur in Karaman province, with a particular focus on the factors that influence purchasing decisions and consumer knowledge about its effects on human health. The majority of consumers are farmers and civil servants with varying levels of education. The study finds that factors such as expiration date, brand, and price significantly impact consumers' purchasing decisions, with flavor also being an important criterion. In contrast, packaging and cooking time are less significant factors. It is generally observed that men are responsible for purchasing decisions. Additionally, most consumers lack sufficient information about the health effects of bulgur, although highly educated consumers tend to have better knowledge about its nutritional benefits, and this knowledge increases with their level of education. The study also revealed that bulgur is mostly consumed as pilaf, with the least frequent consumption being once a month.

3.4. Main factors in consumers' preference

In this part, the reasons why consumers living in the urban area of Kahramanmaraş prefer bulgur and similar bulgur derivatives and the factors behind these preferences have been investigated (Tables 4-5). 63.1% of the participants stated that they prefer these products due to the high production rate in their region. This shows the impact of local production on consumer preferences. In addition, 86.6% of the participants stated that bulgur and similar products are frequently consumed by their families and circles, indicating that cultural and social factors play an important role in the preference for bulgur derivatives. However, 44.3% of the respondents indicated that they were interested in learning about the benefits of bulgur from social media, radio, and/or television programs. However, this rate indicates that interest in information is limited and that more awareness-raising activities are needed.

Table 4. Evaluation of participants' reasons for preference

	Yes		No	
	Number	**%**	**Number**	**%**
I prefer it because it is nutritious and satisfying.	289	82.6	61	17.4
I prefer it because it cooks quickly.	218	62.3	132	37.7
I prefer it because it has a long shelf life	263	75.1	87	24.9
I enjoy consuming dishes made from this product because of its taste.	296	84.6	54	15.4
I prefer it because it's well-loved and enjoyed by my family.	279	79.7	71	20.3
I select it because it promotes good health.	282	80.6	68	19.4

Table 5. Evaluation of participants' reasons for preference

	Yes		No	
	Number	**%**	**Number**	**%**
I prefer it because of the high production rate in the region where I live.	221	63.1	129	36.9
It is consumed a lot in my family and circle.	303	86.6	47	13.4
I am interested in information about the benefits of bulgur on social media, radio, and/or TV programs.	155	44.3	195	55.7

In conclusion, local production, family, and environmental impacts play an important role in the preference for bulgur and similar products in Kahramanmaraş province. However, more information about the benefits of bulgur through the media may increase consumers' interest in these products. These findings emphasize that local production and social environment are determining factors in food preferences.

3.5. Importance of nutrition and health

The nutritional value of a human diet is important for being healthy. This part was conducted to assess participants' views on nutrient content (Table 6). According to the data obtained, it was found that the majority of the participants (66%) had information about different types of bulgur and paid attention to this when shopping. The proportion of participants who prefer organic production is as high as 81.4%. In addition, 63.4% of the participants stated that they prefer organic foods because they are rich in fiber, vitamin B1, and folic acid. 62.9% of the participants stated that they prefer foods because they do not contain cholesterol and unsaturated fats. 57.4% of the participants stated that they were informed that it contains gluten and that people with gluten sensitivity should use it with caution. Finally, 55.1% of the participants stated that they preferred the foods because of the low glycemic index. These results show the participants' awareness and preferences regarding nutrient content. In particular, a high level of awareness was observed regarding organic production and the potential effects of nutrients on health. These data provide valuable information for research on dietary habits and health awareness.

Table 6. Evaluation of participants' views on nutrient content

	Yes		No	
	Number	**%**	**Number**	**%**
I know there are different types of bulgur, and I pay attention to that when I buy.	231	66.0	119	34.0
I prefer organic production.	285	81.4	65	18.6
I prefer it because it is rich in pulses/fiber, vitamin B1, and folic acid.	222	63.4	128	36.6
I prefer it because it is free of cholesterol and unsaturated fat.	220	62.9	130	37.1
I have information that it contains gluten and that people who are sensitive to gluten should use it with caution.	201	57.4	149	42.6
I prefer it because it has a low glycemic index.	193	55.1	157	44.9

3.6. Evaluation of participants' preference for packaging and storage

This study was conducted to assess the opinions of the participants about packaged products and products sold in the open. Consumer preferences regarding the packaging needs for bulgur and bulgur products are shown in Table 7. According to the data obtained, 91.1% of the participants prefer products that do not contain foreign substances (stones, soil, etc.). 54.6% of the participants stated that they make their own products from bulgur at home. While 40.9% of the respondents buy products sold in the open, 73.7% prefer packaged products, 67.7% of respondents have knowledge about the packaging materials used in the market, and 66.6% know the differences between these materials and their effects on the product. 90.3% of respondents think that packaging should have a label indicating product content, optimal use, and storage conditions. 89.1% of the respondents think that the packaging design should best represent the product and be easy to use, and 71.1% of the participants stated that they place the packaged product in the cupboard when they bring it home.

The rate of those who pay attention to the production and expiration date on the packaging of the product is 92.6%. 95.7% of the participants stopped consuming when they noticed any change in the smell, color, or taste of the product. 76.3% of the respondents stopped consumption when they noticed that the product was insect-infested during storage. 43.4% of respondents think that the characteristics of packaged products and products sold in the open are the same. Finally, 58.9% of respondents know that the storage temperature should not be above 18°C and humidity should not be above 65%. These results shed light on respondents' awareness and

preferences regarding packaged and openly sold products. A high level of awareness of the importance of packaging on product quality and safety was observed.

Table 7. Evaluation of participants' packaging and storage preferences

Items	Yes		No	
	Number	%	Number	%
I prefer no foreign matter (stones, soil, etc.).	319	91.1	31	8.9
At home, we make our own from bulgur.	191	54.6	159	45.4
I buy products sold in the open.	143	40.9	207	59.1
I buy the packaged product.	258	73.7	92	26.3
I know the packaging materials used in the market. (Example: polyethylene, cellophane, polypropylene, paper, cloth or sack)	237	67.7	113	32.3
I know the differences between the packaging materials used and their impact on the product.	233	66.6	117	33.4
The packaging must have a label indicating the contents, optimal use, and storage conditions of the product.	316	90.3	34	9.7
The packaging design should best represent the product and be easy to use.	312	89.1	38	10.9
When I buy a packaged product and bring it home, I put it packaged in the cupboard.	249	71.1	101	28.9
When buying, I pay attention to the production and expiration date on the packaging.	324	92.6	26	7.4
If I notice any change in the smell, color, or taste of the product, I stop consuming it.	335	95.7	15	4.3
If I see that the product is infested during storage, I stop consuming it.	267	76.3	83	23.7
The characteristics of packaged products and products sold in the open are the same.	152	43.4	198	56.6
I know that the storage temperature should be 18°C, and the humidity should not be above 65%.	206	58.9	144	41.1

3.7. Determination of the factors affecting the packaging and storage preferences of consumers

This study aimed to analyze the relationship between consumers' packaging and storage preferences and age. According to the data obtained, consumers showed different packaging and storage preferences according to age groups.

Preference for products without foreign substances: 91.1% of the participants preferred products without foreign substances, while there was no statistically significant difference between age groups (p=0.090).

Making your own products from bulgur at home: A significant difference was found between age groups in the proportion of those who made their own products at home (p=0.014). Participants in the 26-35 age group (30.4%) stand out as the group with the highest rate of this habit.

Purchasing openly sold products: The preference for buying products sold in the open did not show a significant difference between age groups (p=0.203).

Buying packaged products: The preference for buying packaged products did not show a significant difference between age groups (p=0.056).

Knowledge about packaging materials: Participants' knowledge about packaging materials did not show a significant difference between age groups (p=0.155).

Knowing the differences between packaging materials: The rates of knowing the differences between packaging materials did not show a significant difference between age groups (p=0.649).

Packaging should have a label: The proportion of respondents who thought that packaging should have a label indicating the contents, optimal use, and storage conditions showed a significant difference between age groups (p=0.013). Respondents in the 26-35 age group adopted these views the most.

Packaging design represents the product in the best way: The view that packaging design should represent the product in the best way possible showed a significant difference between age groups (p=0.023). Participants in the 26-35 age group adopted this view the most.

Putting the packaged product in the cupboard when you bring it home: The habit of putting the packaged product in the cupboard when brought home did not show a significant difference between age groups (p=0.090).

Paying attention to the production and expiration dates on the packaging: The rates of paying attention to the production and expiration dates did not show a significant difference between age groups (p=0.698).

Stopping consumption if they notice changes in the smell, color, or taste of the product: The proportion of those who noticed changes in the smell, color, or taste of the product did not show a significant difference between age groups (p=0.616).

Stopping consumption if the product is insect-infested: There was no significant difference between age groups in the rates of stopping consumption if the product was insect-infested (p=0.742).

Thinking that the characteristics of packaged products and openly sold products are the same: This opinion showed a significant difference between age groups (p=0.048). Respondents aged 25 and under were more likely to hold this view.

Having information about storage temperature and humidity: Knowledge about storage temperature and humidity did not show a significant difference between age groups (p=0.409).

These results show that consumers have different awareness and habits about packaging and storage preferences according to age groups. In particular, participants in the 26-35 age groups are more conscious and careful about packaging and storage. These data provide important information for future studies on consumer habits and packaging strategies.

3.7.1. Analyzing the relationship between consumers' packaging and storage preferences and age

The effect of consumers' age and education level on packaging types and storage needs of bulgur and products were tabulated in Tables 8-9.

3.7.2. Analyzing the relationship between consumers' packaging and storage preferences and education level

This study aimed to analyze the relationship between respondents' packaging and storage preferences and their level of education (Table 9). According to the data obtained, participants showed different packaging and storage preferences according to their level of education.

Preference for products without foreign substances**:** 91.1% of the participants preferred products without foreign substances, while there was no statistically significant difference between the levels of education (p=0.476).

Making your own products from bulgur at home: No significant difference was found between education levels in the proportion of those who make their own products at home (p=0.476).

Purchasing openly sold products: The preference for buying openly sold products showed a significant difference between education levels (p=0.019). Secondary education graduates stand out as the group with this habit the most.

Buying packaged products: The preference for buying packaged products did not show a significant difference between education levels (p=0.155).

Knowledge about packaging materials: Participants' knowledge about packaging materials did not show a significant difference between education levels (p=0.776).

Table 8. The relationship between participants' packaging and storage preferences and age

		25 and below		26-35		36-45		46+		X^2	P
		Number	%	Number	%	Number	%	Number	%		
I prefer no foreign matter (stones, soil, etc.).	Yes	103	32.3	99	31.0	61	19.1	56	17.6	6.501	0.090
	No	15	48.4	11	35.5	4	12.9	1	3.2		
At home, we make our own from bulgur.	Yes	57	29.8	58	30.4	34	17.8	42	22.0	10.553	0.014*
	No	61	38.4	52	32.7	31	19.5	15	9.4		
I buy products sold in bulk.	Yes	44	30.8	41	28.7	28	19.6	30	21.0	4.610	0.203
	No	74	35.7	69	33.3	37	17.9	27	13.0		
I buy the packed product.	Yes	95	36.8	79	30.6	49	19.0	35	13.6	7.567	0.056
	No	23	25.0	31	33.7	16	17.4	22	23.9		
I know the packaging materials used in the market. (e.g. polyethylene, cellophane, pp, paper, cloth or sack).	Yes	72	30.4	77	32.5	50	21.1	38	16.0	5.234	0.155
	No	46	40.7	33	29.2	15	13.3	19	16.8		
I know the differences between the packaging materials used and their impact on the product.	Yes	74	31.8	77	33.0	45	19.3	37	15.9	1.648	0.649
	No	44	37.6	33	28.2	20	17.1	20	17.1		
The packaging must have a label indicating the contents, optimal use, and storage conditions of the product.	Yes	98	31.0	104	32.9	61	19.3	53	16.8	10.730	0.013*
	No	20	58.8	6	17.6	4	11.8	4	11.8		
The packaging design should best represent the product and be easy to use.	Yes	97	31.1	101	32.4	62	19.9	52	16.7	9.557	0.023*
	No	21	55.3	9	23.7	3	7.9	5	13.2		
When I buy a packaged product and bring it home, I put it packaged in the cupboard.	Yes	78	31.3	74	29.7	51	20.5	46	18.5	6.496	0.090
	No	40	39.6	36	35.6	14	13.9	11	10.9		
When buying, I pay attention to the	Yes	109	33.6	104	32.1	60	18.5	51	15.7	1.432	0.698

production and expiration date on the packaging.	No	9	34.6	6	23.1	5	19.2	6	23.1		
If I notice any change in the smell, color, or taste of the product, I stop consuming it.	Yes	111	33.1	107	31.9	63	18.8	54	16.1	1.795	0.616
	No	7	46.7	3	20.0	2	13.3	3	20.0		
If I see that the product is infested during storage, I stop consuming it.	Yes	89	33.3	82	30.7	53	19.9	43	16.1	1.247	0.742
	No	29	34.9	28	33.7	12	14.5	14	16.9		
The characteristics of packaged products and products sold in the open are the same.	Yes	47	30.9	40	26.3	36	23.7	29	19.1	7.926	0.048*
	No	71	35.9	70	35.4	29	14.6	28	14.1		
I know that the storage temperature should be 18 °C, and the humidity should not be above 65%.	Yes	66	32.0	72	35.0	36	17.5	32	15.5	2.891	0.409
	No	52	36.1	38	26.4	29	20.1	25	17.4		

Knowing the differences between packaging materials: The rate of knowing the differences between packaging materials did not show a significant difference between educational levels (p=0,784).

Packaging should have a label: The proportion of respondents who thought that packaging should have a label indicating the contents, optimal use, and storage conditions did not show a significant difference between education levels (p=0.511).

The packaging design should represent the product in the best way: The opinion that the packaging design should represent the product in the best possible way did not show a significant difference between educational levels (p=0.257).

Putting the packaged product in the cupboard when you bring it home: The habit of putting the packaged product in the cupboard after bringing it home showed a significant difference between educational levels (p=0.022). Secondary education graduates had this habit the most.

Paying attention to the production and expiry dates on the packaging: The rates of paying attention to the production and expiry dates did not show a significant difference between educational levels (p=0.313).

Stopping consumption if they notice changes in the smell, color, or taste of the product: The rates of those who noticed changes in the smell, color**,** or taste of the product did not show a significant difference between education levels (p=0.368).

Stopping consumption in the event of insect infestation: The rates of stopping consumption if the product was insect-infested showed a significant difference between educational levels (p=0.002). Secondary education graduates stand out as the group with the highest level of awareness on this issue.

Thinking that the characteristics of packaged products and openly sold products are the same: This opinion showed a significant difference between education levels (p=0.000). Secondary education graduates were the group that adopted those views the most.

Having information about storage temperature and humidity: Knowledge about storage temperature and humidity did not show a significant difference between educational levels (p=0.797).

These results show that consumers have different awareness and habits about packaging and storage preferences according to their educational levels. Secondary education graduates are more careful and conscious about packaged products and storage of products.

Table 9. The relationship between participants' preference for packaging and storage and education level

		Primary school		High school		Associate degree		License		Master's Degree/ PhD		X^2	P
		Number	%	Number	%	Number	%	Number	%	Number	%		
I prefer no foreign matter (stones, soil, etc.).	Yes	51	16.0	100	31.3	37	11.6	112	35.1	19	6.0	3.512	0.476
	No	2	6.5	11	35.5	2	6.5	13	41.9	3	9.7		
At home, we make our own from bulgur.	Yes	40	20.9	65	34.0	21	11.0	55	28.8	10	5.2	16.431	0.476
	No	13	8.2	46	28.9	18	11.3	70	44.0	12	7.5		
I buy products sold in the open.	Yes	26	18.2	56	39.2	14	9.8	38	26.6	9	6.3	11.756	0.019*
	No	27	13.0	55	26.6	25	12.1	87	42.0	13	6.3		
I buy the packaged product.	Yes	35	13.6	82	31.8	28	10.9	100	38.8	13	5.0	6.664	0.155
	No	18	19.6	29	31.5	11	12.0	25	27.2	9	9.8		
I know the packaging materials used in the market. (Example: polyethylene, cellophane, pp, paper, cloth or sack).	Yes	39	16.5	73	30.8	24	10.1	86	36.3	15	6.3	1.778	0.776
	No	14	12.4	38	33.6	15	13.3	39	34.5	7	6.2		
I know the differences between the packaging materials used and their impact on the product.	Yes	37	15.9	75	32.2	23	9.9	82	35.2	16	6.9	1.739	0.784
	No	16	13.7	36	30.8	16	13.7	43	36.8	6	5.1		
The packaging must have a label indicating the contents, optimal use, and storage conditions of the product.	Yes	49	15.5	102	32.3	37	11.7	109	34.5	19	6.0	3.288	0.511
	No	4	11.8	9	26.5	2	5.9	16	47.1	3	8.8		

The packaging design should best represent the product and be easy to use.	Yes	50	16.0	99	31.7	37	11.9	106	34.0	20	6.4	5.309	0.257
	No	3	7.9	12	31.6	2	5.3	19	50.0	2	5.3		
When I buy a packaged product and bring it home, I put it packaged in the cupboard.	Yes	45	18.1	84	33.7	27	10.8	81	32.5	12	4.8	11.472	0.022*
	No	8	7.9	27	26.7	12	11.9	44	43.6	10	9.9		
When buying, I pay attention to the production and expiration date on the packaging.	Yes	48	14.8	102	31.5	39	12.0	116	35.8	19	5.9	4.756	0.313
	No	5	19.2	9	34.6	0	0.0	9	34.6	3	11.5		
If I notice any change in the smell, color, or taste of the product, I stop consuming it.	Yes	53	15.8	105	31.3	37	11.0	118	35.2	22	6.6	4.291	0.368
	No	0	0.0	6	40.0	2	13.3	7	46.7	0	0.0		
If I see that the product is infested during storage, I stop consuming it.	Yes	46	17.2	90	33.7	29	10.9	92	34.5	10	3.7	16.783	0.002*
	No	7	8.4	21	25.3	10	12.0	33	39.8	12	14.5		
The characteristics of packaged products and products sold in the open are the same.	Yes	34	22.4	57	37.5	15	9.9	41	27.0	5	3.3	22.076	0.000*
	No	19	9.6	54	27.3	24	12.1	84	42.4	17	8.6		
I know that the storage temperature should be 18°C, and the humidity should not be above 65%.	Yes	30	14.6	68	33.0	20	9.7	76	36.9	12	5.8	1.664	0.797
	No	23	16.0	43	29.9	19	13.2	49	34.0	10	6.9		

3.7.3. Analyzing the relationship between consumers' packaging and storage preferences and monthly income

The data revealed were listed in Tables 10-11.

Table 10. The relationship between participants' packaging and storage preferences and monthly income

		<17.000 TL		17.000-30.000TL		30.000 – 45.000 TL		45.000-60.000 TL		> 60.000 TL		X^2	p
		Number	%	Number	%	Number	%	Number	%	Number	%		
I prefer no foreign matter (stones. soil. etc.).	Yes	75	23.5	109	34.2	62	19.4	36	11.3	37	11.6	7.436	0.115
	No	8	25.8	8	25.8	8	25.8	0	0.0	7	22.6		
At home. We make our own from bulgur.	Yes	57	29.8	67	35.1	36	18.8	13	6.8	18	9.4	15.542	0.004*
	No	26	16.4	50	31.4	34	21.4	23	14.5	26	16.4		
I buy products sold in the open.	Yes	38	26.6	45	31.5	24	16.8	14	9.8	22	15.4	3.942	0.414
	No	45	21.7	72	34.8	46	22.2	22	10.6	22	10.6		
I buy the packaged product.	Yes	54	20.9	84	32.6	55	21.3	33	12.8	32	12.4	10.293	0.036*
	No	29	31.5	33	35.9	15	16.3	3	3.3	12	13.0		
I know the packaging materials used in the market. (Example: Polyethylene, cellophane, pp. paper, cloth or sack).	Yes	57	24.1	85	35.9	45	19.0	26	11.0	24	10.1	5.540	0.236
	No	26	23.0	32	28.3	25	22.1	10	8.8	20	17.7		
I know the differences between the packaging materials used and their impact on the product.	Yes	58	24.9	80	34.3	49	21.0	23	9.9	23	9.9	5.108	0.276
	No	25	21.4	37	31.6	21	17.9	13	11.1	21	17.9		
The packaging must have a	Yes	74	23.4	108	34.2	67	21.2	31	9.8	36	11.4	7.330	0.119

label indicating the contents. Optimal use and storage conditions of the product.	No	9	26.5	9	26.5	3	8.8	5	14.7	8	23.5		
The packaging design should best represent the product and be easy to use.	Yes	73	23.4	106	34.0	62	19.9	32	10.3	39	12.5	0.415	0.981
	No	10	26.3	11	28.9	8	21.1	4	10.5	5	13.2		
When I buy a packaged product and bring it home. I put it packaged in the cupboard.	Yes	62	24.9	88	35.3	49	19.7	23	9.2	27	10.8	4.473	0.346
	No	21	20.8	29	28.7	21	20.8	13	12.9	17	16.8		
When buying. I pay attention to the production and expiration date on the packaging.	Yes	74	22.8	107	33.0	69	21.3	33	10.2	41	12.7	5.351	0.253
	No	9	34.6	10	38.5	1	3.8	3	11.5	3	11.5		
If I notice any change in the smell, color, or taste of the product. I stop consuming it.	Yes	78	23.3	113	33.7	69	20.6	35	10.4	40	11.9	4.895	0.298
	No	5	33.3	4	26.7	1	6.7	1	6.7	4	26.7		
If I see that the product is infested during storage. I stop consuming it.	Yes	62	23.2	94	35.2	53	19.9	26	9.7	32	12.0	1.829	0.767
	No	21	25.3	23	27.7	17	20.5	10	12.0	12	14.5		
The characteristics of packaged products and products sold in the open are the same.	Yes	40	26.3	54	35.5	29	19.1	14	9.2	15	9.9	3.098	0.542
	No	43	21.7	63	31.8	41	20.7	22	11.1	29	14.6		
I know that the storage temperature should be 18°C, and the humidity should not be above 65%.	Yes	56	27.2	66	32.0	34	16.5	25	12.1	25	12.1	7.632	0.106
	No	27	18.8	51	35.4	36	25.0	11	7.6	19	13.2		

* $p \leq 0.05$

Table 11. The relationship between participants' packaging and storage preferences and the frequency of consumption of the preferred product

		Daily (%)		Weekly (%)		Biweekly (%)		Monthly (%)		X^2	p
Prefer no foreign matter in bulgur and its derivatives (stones, soil, etc.).	Yes	70	21.9	168	52.7	48	15.0	33	10.3	3.086	0.379
	No	3	9.7	18	58.1	5	16.1	5	16.1		
Producing own bulgur and its derivatives from bulgur at home.	Yes	48	25.1	95	49.7	25	13.1	23	12.0	6.314	0.097
	No	25	15.7	91	57.2	28	17.6	15	9.4		
Buying bulgur and its derivatives in bulk	Yes	41	28.7	65	45.5	25	17.5	12	8.4	11.996	0.007*
	No	32	15.5	121	58.5	28	13.5	26	12.6		
Buying bulgur and its derivatives packed	Yes	63	24.4	132	51.2	36	14.0	27	10.5	7.749	0.051
	No	10	10.9	54	58.7	17	18.5	11	12.0		
Knowing packaging materials used (cellophane, pp, paper, cloth, or sack).	Yes	57	24.1	135	57.0	30	12.7	15	6.3	22.459	0.000*
	No	16	14.2	51	45.1	23	20.4	23	20.4		
Knowing the differences between packaging materials	Yes	52	22.3	135	57.9	28	12.0	18	7.7	14.525	0.002*
	No	21	17.9	51	43.6	25	21.4	20	17.1		
Putting packaged products in the cupboard	Yes	61	24.5	125	50.2	34	13.7	29	11.6	8.647	0.034*
	No	12	11.9	61	60.4	19	18.8	9	8.9		
Paying attention to production/ expiration dates	Yes	73	21.8	175	52.2	53	15.8	34	10.1	10.452	0.015*
	No	0	0.0	11	73.3	0	0.0	4	26.7		
Believing packaged and sold in bulk products are the same	Yes	53	25.7	114	55.3	21	10.2	18	8.7	16.319	0.001*
	No	20	13.9	72	50.0	32	22.2	20	13.9		

*p≤"0.05

Thinking that the properties of packaged products and openly sold products are the same: The rates of thinking that the properties of packaged products and openly sold products are the same showed a significant difference according to the frequency of consumption (p=0.001). The rate of those who hold this view is higher among those who consume once a week.

There was no significant difference between the rates of knowledge of other items and income levels. These results show that consumers have different awareness and habits about packaging and storage preferences according to their consumption frequency. Those who consume every day are especially careful and conscious about packaging and storage. These data provide important information for future studies on consumer habits and packaging strategies.

4. Conclusion

The data obtained in this study demonstrate that Turkish consumers exhibit a strong preference for packaged products and demonstrate a high level of attention to the information presented on the packaging, particularly with regard to production and expiration dates. While these findings suggest an increase in consumer awareness, no concrete data were identified to assess the direct impact of technological innovations and product diversity on this awareness. Nevertheless, consumer behavior regarding packaging and storage preferences offers some insight into the potential impact of technological developments and increased product variety. The fact that the majority of consumers prefer packaged products and are aware of the information about these products indicates

a growing awareness among consumers in general. However, to reach a more definitive conclusion on this issue, further research is needed that directly examines the effects of technological innovations and product variety on conscious consumption. In the Kahramanmaraş region, bulgur and bulgur products are still manufactured using the traditional home production technique, which has been in use for centuries. The products were ready for sale in sacks or in bulk, in cloth bags, or in polymer packages with various features. The purchased products are then stored in tin cans, glass jars, cloth bags, or in the polymer packages in which they were purchased. The survey results show that consumers prefer to store bulgur and bulgur products in the same package in which they bought them. These items should be stored in a cool and dry place. However, consumers lack sufficient information about the nutritional and health benefits of these products. Providing this information should be the responsibility of authorized individuals. Additionally, consumers should not be aware of the impact of the packaging materials used on the product features. The findings of the thesis study indicate that bulgur and fine bulgur are widely consumed products, with a preference for the latter in urban areas of the Kahramanmaraş province. In the course of the research, 350 households were surveyed in person, and the consumption habits, packaging preferences, and storage conditions of the participants were examined. The results of the statistical analysis indicated that 75% of the participants consume bulgur at least once a week, with 60% of them including it in their families' daily diet. Furthermore, 40% of respondents typically consume bulgur openly or as it is produced in their own homes, while 35% prefer products packaged in polymer bags. These findings indicate that bulgur is a significant food item in Kahramanmaraş province, with consumption habits largely based on traditional methods. However, it was revealed that consumers lack sufficient knowledge about the effects of packaging materials on shelf life, underscoring the need for increased awareness of this issue. It is recommended that after consumers become aware of this, incentive policies and practices should be developed to determine their preferences, and they can develop new packaging systems to eliminate deterioration of the products by insects, light, etc.

Based on the identified gaps in consumer knowledge, the following policy recommendations might be proposed:

A. For companies: Develop marketing campaigns that emphasize the nutritional benefits of bulgur, such as its high fiber and vitamin content. Introducing innovative packaging designs that highlight these health benefits could attract more health-conscious consumers.

B. For government institutions: Launch public awareness programs to educate consumers about the health benefits of bulgur and other traditional foods. Nutrition labeling requirements could also be enforced to improve consumer understanding.

C. For non-governmental organizations: Work with local communities to organize workshops on traditional bulgur production methods and their nutritional value. These initiatives can help bridge the knowledge gap, especially among younger generations.

The key findings of this study could be summarized as follows:

A. A significant portion of consumers prefer packaged bulgur due to its hygiene and longer shelf life.

B. Many consumers are unaware of the nutritional value of bulgur, suggesting a need for better consumer education.

C. Bulk purchases and home production remain common, particularly among older generations, indicating a cultural element in bulgur consumption patterns.

Ethics Permissions

The appropriate protocols were utilized to protect the rights and privacy of all participants during the execution of the research and were approved by the Science and Engineering Ethics Committee of Gaziantep University (Protocol no: 006, 26/02/2024). In this study, participation was not mandatory, and the research requirements and risks were fully disclosed. All participants provided verbal consent and had the option to withdraw from the study at any time.

Author Contributions

Reyyan Şimşek: Writing- Original draft preparation, Formal analysis, Investigation, Statistical Analysis. Validation.

Sevim Kaya (Corresponding author): Project administration, Conceptualization, Writing-Reviewing and Editing.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Bayram, M., 2007. Application of bulgur technology to food aid programs. *Cereal Foods World*, 52(5), 249-256.

Belibağlı, K. B., Vardin, H. and Dalgıç, A.Ç. (2009). Bulgur işlemede gıda güvenliği ve kalite yönetim sistemlerinin uygulanması. *Italian Journal of Food Science/Rivista Italiana di Scienza degli Alimenti*, 21(4), 509-516.

Bilgiçli, N. and Soylu, S. (2016). Buğday ve un kalitesinin sektörel açıdan değerlendirilmesi. *Bahri Dağdaş Bitkisel Araştırma Dergisi*, 5(2), 58-67.

Dönmez, E., Salantur, A., Yazar, S., Akar, T. and Yıldırım Y., (2004). Situation of bulgur in Turkey and cultivar development for bulgur. *Tarla Bitkileri Merkez Araştırma Enstitüsü Dergisi*, 13(1-2).

Gupta, O. P., Kumar, S., Pandey, A., Khan, M. K., Singh, S. K., and Singh, G. P. (Eds.). (2023). Wheat science: Nutritional and anti-nutritional properties, processing, storage, bioactivity, and product development. *CRC Press.*

Gökkaya Erdem, B., Masri, B., and Kaya, S. (2023). Determining the factors affecting drinking milk consumption habits in Turkey: The example of Gaziantep province. *Harran Üniversitesi Mühendislik Dergisi,* 8(3), 198-216. https://doi.org/10.46578/humder.1367836.

Kayaoğlu, A., and Gülmez, Y. S. (2022). Determination of factors affecting consumers' bulgur consumption preferences. *Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi,* 10(2), 869-885.

Kasar, H., Gokmen, S. and Çağlar, A. (2021). Farklı pişirme tekniklerinin bazı geleneksel fırın ürünlerinin duyusal kalitelerini geliştirmede ve besin kayıplarını azaltmada kullanılabilirlikleri üzerine bir araştırma. *Avrupa Bilim ve Teknoloji Dergisi*, (28), 70-74.

Michel, S., and Bayram, M. (2024). Influence of cooking water hardness on the chemical, color and textural characteristics of bulgur at different processing stages. *Journal of Cereal Science,* 115, 103826

Özbay, M., Karataş, M. and Asim, M. A. (2016). Determination of different demographic, socio-economic factors on bulgur consumption in Karaman. *Journal of Applied Biological Sciences*, 10(3), 53-60.

Saad, I. Y., Bayram, M., and Kesen, S. (2018). Characterization of volatile compounds of bulgur (Antep type) produced from durum wheat. *Hindawi Journal of Food Quality*, 2018(1), 8564086. https://doi.org/10.1155/2018/8564086.

Sumiahadi, A., Mülayim, M., Acar, R., and Dağdaş, B. (2020). Tahılların depolanmasında genel prensipler ve çeltiğin depolanması. *Bitkisel Araştırma Dergisi Journal of Bahri Dagdas Crop Research*, 9(1), 102-112.

Tekin-Cakmak, Z. H., Ozer, C., Ozkan, K., Yildirim, H., Sestili, F., Jilal, A., Sagdic, O., Ozgolet, M., and Koksel, H. (2024). High-beta-glucan and low-glycemic index functional bulgur produced from high-beta-glucan barley. *Journal of Functional Foods*, 112, 105939. https://doi.org/10.1016/j.jff.2023.105939.

Xie, Y. (2017). *Research on grains packaging design and consumer preferences.* Conference: In 2017 7th International Conference on Mechatronics, Computer and Education Informationization (MCEI 2017) (pp.225-336). Atlantis Press. 10.2991/mcei-17.2017.73.

Yılmaz, M. S., and Yıldırım, A. (2020). Firik üretim teknikleri ve fonksiyonel özellikleri. *Harran Üniversitesi Mühendislik Dergisi*, 5(2), 109-121.