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# International Journal of Gastronomy Research

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## ABOUT THIS JOURNAL

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# A Study on the Change of Menu Lists with the Effect of Pandemic in the Gastronomy Sector: Istanbul Province Fine-Dining Restaurant Examples

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## Abstract

The COVID-19 pandemic, which is one of the most influential events of today, has a great impact on the gastronomy sector as well as making its impact felt in many sectors. Despite the current pandemic conditions, human being as a social being needs to eat out for physiological, psychological, economic and social reasons. In order to meet this need, individuals of all ages and demographics who are active, retired, not working, family with children or living alone, especially on weekends, become customers of eating and drinking places suitable for their budget. At this point, chefs of eating and drinking places, which is described as fine-dining in Istanbul, which has many alternative restaurants, feel the need to include healthier and immune-boosting foods and beverages on their menu lists. Fine-dining restaurants are a type of restaurant where the ambiance of the place is extremely important, where there are creative, world cuisine-influenced, mostly small portions of tasting menus, mostly made using seasonal and local products. Fine-dining restaurants in Istanbul comprise the main subject of the study. In this study, pre-pandemic and post-pandemic menus of fine-dining restaurants in Istanbul were examined to reveal the impact of the COVID-19 pandemic on the Turkish gastronomy sector. In addition, the effects of the pandemic on the food and beverage sector and the changes made in the menu lists were determined. The content of the study is based on the semi-structured interview technique. The obtained data were evaluated with content analysis and the findings were interpreted.

**Keywords:** COVID-19, Fine-Dining, Food and Beverage Services, Gastronomy, Menu.

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## 1. Introduction

The COVID-19 virus, which is influential on the lives of many people globally, has had a negative impact on many sectors in the world and in Turkey. The inability to make national and international travels, flight cancellations, continuing education online, quarantine practices and the implementation of lockdowns by governments have deeply affected all sectors. The implementation of lockdowns has also had a negative impact on the psychology of people. As the food and beverage industry is closely related to eating outside, drinking coffee-tea or something else outside, these situations above has caused businesses to be closed for a long time (Okat et al., 2020).

The World Health Organization (WHO) first current complaints was a new type of coronavirus

(2019-nCoV), and on February 11, 2020, this new virus was named SARS-CoV-2. The epidemic, which is called the "COVID-19" pandemic in short, spread to many countries in a short time, especially the Asian region countries, after China, and reached an international dimension that affected the whole world. It was perceived as a threat because it had an impact in many countries and continents in the world and its rate of spread was very high, and it was described as a "pandemic" with its general name. Due to its ability to easily spread from person to person, urgent measures have been taken (İflazoğlu & Aksoy, 2020).

According to the definition of the World Health Organization (WHO), three criteria are sought in general terms for a disease to be a pandemic. It should be a new virus or a mutated factor, be easily transmitted to humans, and be easily and continuously

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transmitted from person to person. Pandemic declaration is announced by WHO when clear criteria for a pandemic are met. The reason for this announcement is that the disease factor that poses a threat to all countries, in other words, the new virus that has emerged somehow spreads easily from person to person. Considering the rate of spread of Coronavirus (COVID-19) and its effect on human health, a pandemic has been declared in order to increase protective measures in general. It has been decided to take many measures in order to reduce the spread of the infection in the community and thus reduce the number of people who will be infected in the early stages of the pandemic and the cases that will arise due to the pandemic by applying infection prevention and control measures. These measures are protection and control measures for the source, for the way of transmission, for the healthy person. For example; restriction of population movements, implementation of quarantine, improvement of environmental conditions (disinfection), control of many private and public institutions, including the food and beverage sector (TÜBA, 2020) are within this scope. This situation has had a negative impact on food and beverage businesses as well as on many sectors that add vitality to social life and economy. Concern for health has led to the necessity of taking precautions. Consumers have also shown interest in cooking and eating at home instead of eating out. Since food and beverage businesses are also known to be a socializing environment for individuals, it is seen that restaurants are affected by restrictions such as "stay at home policy" and "social distance" implemented by governments in many countries during the pandemic process. In order to protect citizens from the COVID-19 pandemic in Turkey and to prevent the spread of the pandemic, the activities of food and beverage businesses were stopped on March 21, 2020, providing only takeaway and ordering services without allowing consumers to sit and eat (Ministry of Interior of Republic of Turkey, 2020). As of June 1, 2020, food and beverage businesses have started to provide table service again. The main purpose of this research is to investigate whether foods and beverages beneficial for human health or strengthen immunity are included in the menu lists before and after the epidemic with the reopening of restaurants.

Food and beverage businesses are grouped into commercial (luxury, ethnic, etc. restaurants) and non-commercial (corporate and industrial) businesses. In this context, there are various differences between restaurants in the food and beverage industry.

Restaurants can also be classified according to factors such as their menu content, menu price, service quality and atmosphere (Top & Yarmacı, 2020). Fine dining restaurants, which are described as the concept of new restaurant, are restaurants with a high ambiance, inspired by the cuisines of countries, giving importance to creativity and serving small portions of food with high nutritional value accompanied by excellent service (Hwang & Ok, 2013). Fine Dining restaurants are restaurant types that are creative, influenced by world cuisines, serves with master chefs with strong artistic skills, where atmosphere and service are extremely important (Top & Yarmacı, 2020). In such restaurants, food is served in small portions for tasting. More organic and creative menus are created by preferring the use of local products.

The concept of Fine Dining restaurant is encountered for the first time in France. The restaurant in its present form was opened in Paris in 1765 by a Frenchman named Bouglanger. This name forms the basis for the development of Gastronomy and Culinary Arts for France. The first luxury restaurant was La Grande Taverne de Londes, opened in Paris in 1782 by Antoine Beauvilliers. In a good restaurant, it is of great importance that what dishes will be served and which beverage (wine) will be served in accordance with the menu. The development of Fine Dining restaurants could be examined in three time intervals; IX. century "Grand Cuisine" starting with Careme, "Haute Cuisine" at the beginning of XX. century and "Nouvelle Cuisine" at the last quarter of XX. century. The most important time period is the innovative kitchen movement known as "Nouvelle Cuisine", which started in the 1970s. In this period, the understanding of fine dining, which was integrated with the French, began to spread from France to the whole world. In 1827, the first chain restaurant business named Dolmonicos, which offers high quality menus to its guests at high prices, appears as fine dining in the United States (Akoğlu & Öztürk, 2018).

Fine dining understanding has changed over the past ten years. While menus from French cuisine were offered in previous years, today it interacts with different ethnic cuisines and a return to world cuisine is observed. It is seen that a modern, innovative change has been made in the menus, which is more suitable for today (Topal & Gök, 2020). The menus, which have been given an innovative shape, have a positive effect on customer satisfaction. The service provided is as important as the food served in Fine Dining restaurants. Due to the quality of the service and social values, the customer profile of these restaurants

consists of people with a high income level (Top & Yarmacı, 2020).

Fine Dining restaurant issue is not fully known in Turkey. Despite the fact that French cuisine serves food with small portions, Turkish cuisine consists of dishes that are flavored with larger portions without using sauce, which shows that Turkish citizens are far from concept and presentation. Today, the training of new chefs in the field of gastronomy and the possibility of accessing the menu all over the world thanks to technology increase the recognition and awareness of Fine Dining restaurants. In this direction, it is investigated whether changes have been made due to the COVID-19 pandemic in the menu lists of the restaurants in the status of luxury restaurants that comply with the concept of Fine Dining in Istanbul. The COVID-19 pandemic, which has affected countries with a health threat, has pushed people to take measures to strengthen their immunity, as well as to comply with cleaning, mask and social distance rules. For this reason, it is aimed to investigate whether food and beverages that will strengthen immunity are included in the preferred luxury restaurants, while the need of humans as social creatures for eating out is being met.

## 2. Conceptual Framework

Restaurant businesses, which have an important place in the food and beverage sector, would like to satisfy their customers, gain new customers and offer different services. Due to the increase in the variety of products offered, the effect of fashion and habits, and intense competition, businesses must always follow innovations and be dynamic. Until the end of 1980, the number of restaurants in Turkey was not very high. Due to their habits, Turks preferred to consume what they cooked at home instead of eating out. With the increasing number of restaurants and the affordable prices, people from all walks of life have realized their desire to eat out (Spang, 2000). In the commercial sense, people's consumption of food outside their homes includes the consumption of food and beverages produced and served by a business in a different location for a certain fee (Top and Yarmacı, 2020). Especially innovations in luxury restaurants, aesthetic and physical elements, warmth and comfort arising from the atmosphere make these restaurants attractive for customers (Birdir & Kale, 2014). In this context, fine-dining restaurant concept has started to be adopted by businesses in Turkey. Turkish cuisine, which has a long history, has changed due to many reasons such as the influence of the West, the mass media, and the change of the food industry. However,

Turkish cuisine should be able to preserve its existence and characteristics among other cuisines in the world, and its difference should be noticed (Güler, 2007). Turkish cuisine, which has an important place among world cuisines, aims to protect human health with some healing recipes. In this context, the countries of the world, which have been under the influence of an epidemic disease since March 2020, have developed various alternatives to combat the disease and brought up the benefits of consuming foods that will strengthen immunity until a vaccine is founded by scientists.

The COVID-19 pandemic, which emerged for the first time in Wuhan, China and left the world under its influence in a short time, has also put international health authorities in action. In line with the instructions of the World Health Organization, national governments have taken various measures to protect public health and to get rid of the epidemic with the least effect (Acar, 2020). As of March 11, 2020, when the corona virus was first seen in Turkey, travel restrictions abroad began at first. Elit World, one of the world-famous hotel chains, temporarily shut down 6 hotels in Turkey and reduced the capacity of 2 hotels of it (Aylan, 2020). The anxiety, fear, and depression created by the COVID-19 pandemic have made both individuals and sectors, and therefore food and beverage businesses, uneasy. Its psychological, sociological and economic effects have been more and more felt by people who are social beings (Demir et al., 2020). Procedures such as preparation of social distance plan, use of hygienic materials and ventilation have been determined in mandatory applications in food and beverage businesses. In addition to the use of protective equipment by the personnel and general health control, rules have been determined on the issues such as cleaning in the kitchen, waste management, sterilization of dishes after washing, automatically opening sinks, disposable hand drying towels (Doğancılı, 2020). Among the measures taken by restaurants, there are factors such as increasing the distance between tables, using disinfectants, switching to digital menus, and contactless payment. For instance, while Amara World Hotel focused on providing food hygiene with non-contact buffet, ozonated water during the COVID-19 pandemic process, Faustina Hotel shared this process on their web pages by making applications such as temperature measurement and personal protective equipment including masks, visors, bones and gloves (Karamustafa et al., 2021). Another application that has changed and developed with the pandemic is that the use of information processing technologies such as



wireless internet and tablet menus instead of printed menus. As an alternative to the traditional menu, tablet menus have also started to become widespread day by day (Sürücü et al., 2018).

The facts that all inclusive system is abolished, and the food services applied as open buffet in the food and beverage departments are replaced with fixed menus with options expressed are among the effects of COVID-19 pandemic in the tourism sector in our country. In addition, technological applications were included in order to reduce contact at the point of check in/out service, closed packaged beverages and disposable packaged materials were offered instead of open drinks in bars and restaurants. Thus, efforts have been made to ensure that customers prefer businesses that take into account conditions such as hygiene and sanitation (Özdemir, 2020). When people's eating preferences are examined, it is observed that five factors are considered first. These issues are expressed as food quality, menu variety, price, atmosphere and convenience (Özdemir, 2010). Today, in addition to the importance of hygiene and sanitation brought by the COVID-19 pandemic, people's tendencies towards healthy eating are also increasing. For this reason, food and beverage businesses have tended to make some changes.

The method of the research conducted to examine The Changes with the Effect of the COVID-19 Pandemic in the Menu Lists of Fine-Dining Restaurants in Istanbul in the Gastronomy Sector is given below.

### 3. Method

The aim of this research is to examine whether the menu lists have changed before and after COVID-19 in Fine-dining restaurant businesses operating in Istanbul. The results of the research give an idea about how pandemics affect food and beverage businesses. In addition, the research will provide information on whether the menu lists prepared by Fine-dining restaurant managers and chefs operating in Istanbul include immune system-boosting meals or not.

The ethics committee permission document required for the collection of data used in this study was obtained from Istanbul Aiyansaray University Ethics Committee with the date of 28.10.2021 and the decision / issue number of 2021 / 09. In this study, the interview technique, which is one of the qualitative research methods, was used (Okumuş, 2020).

In the research, findings were obtained with the opinions of 10 participants between September 6, 2021 and October 1, 2021 by using the interview technique

from 10 Fine-dining restaurant businesses operating in Istanbul. The participants whose opinions were taken consist of managers and chefs working in Fine-dining restaurants operating in Istanbul. Opinions of the participants were obtained by asking 10 semi-structured questions using the interview technique. The interview questions were created by the researchers using the literature and studies on Fine-dining. In order to ensure confirmability in qualitative research, the data of the research and the findings were obtained by noting the e-mail and telephone conversations due to the ongoing pandemic measures. In this qualitative applied research, descriptive analysis was made. In order to increase the validity of the research, the answers given by the participants are given in the form of direct quotations in the findings section.

The population of the research consists of 10 Fine-dining restaurants operating in Istanbul. The main reason for determining the population as Fine-dining restaurant businesses operating in Istanbul is that Istanbul has different qualities compared to other provinces in every aspect. These qualities are that level of income is high and Istanbul is a brand city. According to this, when the Istanbul tourism statistics report on the website of the Ministry of Culture and Tourism dated July 1, 2020 is examined, it has been found that 155 restaurants of total 199 food and beverage businesses are in the first-class category and 44 of them are in the second-class restaurants. However, it has been determined that there is no data in the Fine-dining category in the statistics of the Ministry of Culture and Tourism of Republic of Turkey (2020), and statistical information about Fine-dining restaurants is included in luxury restaurants (first class-second class).

The population of the research consists of 10 fine-dining restaurant businesses, which are members of the Association of Tourism Restaurant Investors and Gastronomy Businesses and operating in Istanbul, selected by random method.

The researchers contacted directly with the businesses that make up the population. Interviews with 10 participants from 10 Fine-dining restaurant businesses that accepted the research were carried out by noting e-mail and phone calls due to the pandemic. The questions asked to the participants are given below.

- Was your restaurant able to operate due to the COVID-19 pandemic?
- When were you open and closed due to the closure applied in the country?



- Have your staff had any health problems due to the pandemic?
- Have your staff quitted their jobs due to health problems?
- How has your business been affected by the pandemic?
- Have the menu lists been prepared considering the COVID-19 pandemic?
- Which food groups did you include before the pandemic?
- Which food groups have you included after the pandemic?
- Are there any special products that you use that are described as foods that will strengthen immunity?
- What are the arrangements made in the menus depending on the products that strengthen the immune system?

#### 4. Results and Discussion

As seen in Table 1, 9 of the participants were male and 1 was female. Looking at their duties and positions, it is seen that there are 2 managers and 8 executive chefs.

First of all, the participants were asked, "Was your restaurant be able to operate due to the COVID-19 pandemic?". All participants answered this question: "Operation was carried out within the framework of the rules set by the state, package and pick-up service was provided".

The second question posed to the participants was "When were you open and closed due to the closure in the country?" Except for the P5, they all answered that "We were closed for 3 months as of March 2020 at the beginning of the pandemic. Afterwards, takeaway and package services were started". P5 participant said, "We could not provide service between May 2020 and November 2020. In the following period, we continued to serve with a system where employees come to work alternately with short working hours."

The third question directed to the participants was "Have your staff had any health problems due to the pandemic?" P3 and P6 participants said, "Many of our teammates have health problems. For this reason, the company organized the way of working in groups of 2". The P4 participant stated that "No, it did not happen". Other participants, on the other hand, stated that "The staff were only rested due to the COVID-19 quarantine and contact, we continued to work in the remaining times".

The fourth question directed to the participants was "Have the employees quitted their jobs due to health

Table 1. Chefs and managers at fine-dining in İstanbul

| Gender | Position       | Participant Code |
|--------|----------------|------------------|
| Male   | Executive Chef | P1               |
| Male   | Executive Chef | P2               |
| Male   | Executive Chef | P3               |
| Female | Manager        | P4               |
| Male   | Manager        | P5               |
| Male   | Executive Chef | P6               |
| Male   | Executive Chef | P7               |
| Male   | Executive Chef | P8               |
| Male   | Executive Chef | P9               |
| Male   | Executive Chef | P10              |

problems?" P4 said that "Staff did not come to work, there was no layoff, there was no one with covid". While the other participants answered, "There was no situation of leaving the job, but we tried to keep our colleagues with chronic illness away from the work area as much as possible, both in line with their own wishes and with the decisions taken. With the support of the state, we have survived most of this process without any loss of rights or grievances."

The fifth question directed to the participants was "How has your business been affected by the pandemic?" P4 said, "We have suffered economically much. Since the restaurant is located in a region with very high rents, namely in Etiler, government support was not received. Due to the pandemic, the landlord has not made any reductions in rent. Fixed costs; electricity, water etc. were paid regularly". P6 replied, "Our company spent the period with 70% turnover loss". Other participants said, "Of course, there was a financial loss during the closure period. Due to the closure of the workplace, some payments have decreased, but the slightest spending without any gain means expense. In the period we were open, it was a very troublesome process in serving with 50% capacity, but we can say that at least it was a bit of a breather for the system to be operational again."

The sixth question directed to the participants was "Have the menu lists been prepared considering the COVID-19 pandemic?" While the participants of P2, P3, P8, P9 replied, "We continued with our standard menus, we did not design a menu related to COVID-19", the participants of P1, P6, P7, P10 gave this answer "A few main foods and beverages were removed from the menu, but there was no product prepared by considering it". P4 said "Yes. Vegetables were especially included. New menu lists have been added to vegetarian and vegan menus." P5 said, "The menu lists continued without the need for a change at first."

Later, material losses and supply disruptions due to the low-capacity service situation pushed us to make changes in the menu. Another of the most important reasons for this situation was to prevent the employees from having problems during the operation as they continue to work in small groups on a rotating basis."

The seventh question directed to the participants was "Which food groups did you include before the pandemic?" P4 said, "As our restaurant is seafood, our main menu has remained constant. There was no change, only the variety of salads was increased", while the P5 said, "Our menu has a very rich structure, and it is possible to find products from almost every food group. We used to serve meat dishes, poultry, appetizers and salads, pasta and cereal dishes, and with very rich patisserie products". Other participants used the statement "There was no change in food and beverages before and after the pandemic".

The eighth question directed to the participants was "Which food groups have you included after the pandemic?" P4 said, "While we did not include avocado on our menu before the pandemic, we added avocado after the pandemic. We added three or four kinds of fruit juices", P5 said that "We did not make any changes in food groups, but we reduced the number of products on the menu considerably. We have removed our less preferred products from the menu, especially those that are costly and have difficult storage conditions. We continue on our way with the most preferred products, with which we can obtain a wide variety with less material, and which will not force our employees. Our aim is not to break the quality standards with both faster and uninterrupted service and a concise menu item". P6 replied "We mainly used protein products, olive oil, vegetables and salad products" and the other participants replied, "There was no change in food and beverage after the pandemic".

The ninth question directed to the participants was "Are there any special products that you use that are described as foods that will strengthen immunity?". While the P1 replied, "We especially recommended fresh ginger tea as an immune booster among our herbal teas"; P2 said "The foods on our menu provide important vitamins and protein for human health, so we did not search for a different one", P4 said "We bought fields and built a vegetable garden in Kilyos to include products that will strengthen immunity. We started to grow organic, natural products without using any fertilizer. We planted the seeds we bought from the swap seed festivals in Greece

Alexandroupolis and Turkey. We planted products such as melon seeds, pink tomatoes, zucchini, and corn, which are heirlooms", while the other participants gave the statement, "We did not use a special product on the menu".

The tenth question directed to the participants was "What are the arrangements made in the menus depending on the products that strengthen immunity?" P1 said "Generally, lighter food and beverages were brought to the fore", P2 said "We did not make any effort to make changes", P3 said "We focused on products like salad with quinoa, salad with flaxseed added, meat dishes marinated with rosemary, thyme, saffron rice and sherbet blended with special vinegar." P4 said "We always preferred to use natural products in our restaurant. Before the pandemic, for example, we had pink tomatoes brought from Tire. There has been a change in our lists for a vegetable-based vegan diet that will strengthen immunity after the pandemic. We have added quinoa salad varieties to our menu. We started to use flaxseed more". P5 said that "With the sensitivity we show to the quality of the products we use and to have a balanced distribution on our plates, we aim to protect people's health and maintain a healthy life, rather than just feeding them. This is one of the most important goals of our profession. In this sense, we do not have a product that we use in particular, but we are trying to include fermented foods, beneficial plants and foods with probiotic properties in our menu." P6 said "Our menus are always based on healthy products, we did not make any extra immune-boosting products during the COVID-19 period", P7 said "We especially used chili pepper, mint, thyme, turmeric, black pepper, ginger and cumin, P8 said "We included products such as homemade pickles, roasted peppers, ground balsamic, artichoke soup, celery with oranges", P9 said "We especially recommend minestrone soup. It was very popular with customers". P10 said "We included fermented products and fresh avocado-based fish products"

## 5. Conclusion

People have to eat to survive. Maintaining a healthy life is the most basic desire of every individual. Human being is a social being. While nutrition meets the biological need of satisfying one's hunger, feeling full and satisfying the stomach; the need and activity of eating also manifests itself in the form of socializing, cultural exchange, making friends and acquaintances, etc., and of the tendency to prefer places where the majority go. The current COVID-19 outbreak has led

people to spend time at home and become individualized. In order to protect people from the COVID-19 epidemic in Turkey and to prevent the spread of the epidemic, food and beverage businesses stopped their face-to-face activities on March 21, 2020. Food and beverage businesses have implemented only takeaway and package service with the decision taken by the government, without allowing their customers to sit in their venues. As of June 1, 2020, food and beverage businesses have started to provide table service again. The decision to close and reopen food and beverage businesses is a public policy decision. It has been determined that increasing food and operating costs due to the epidemic adversely affected food and beverage businesses.

Consumers have also been psychologically affected by the increase in the number of cases and death news along with the pandemic. Considering the situation of the pandemic, they were very selective in their choice of eating out and choosing a restaurant. While a return to the way of eating at home, as in the old times, has been observed for a long time, it has been determined that there is an increase in the sales of flour and yeast, which are market products, due to making pastry products at home, such as bread, cake, pastry, pies, donuts, etc. It has been observed that foods such as sourdough, household vinegar, fermented products, and pickles that strengthen the immune system are frequently used in the COVID-19 pandemic.

In this research, which was about the change of menu lists in the gastronomy sector with the effect of the COVID-19 pandemic, interviews were held with the chefs and managers of 10 Fine-dining restaurants in Istanbul. Results were obtained by using the interview technique in the questions asked to the participants in the research.

When the results of this research are examined in general, it is understood that the menus of Fine-dining restaurants, which constitute the population of the research, have not been changed much, but they have included some products that will strengthen immunity in their menus. In particular, the menus were improved without preparing different menu lists.

- Food and beverage varieties for vegan and vegetarian diets have been increased.
- Quinoa use, avocado use has increased.
- There has been an increase in the use of vinegar and balsamic vinegar.
- Spices such as chili pepper, mint, thyme, turmeric, cloves and cumin are especially emphasized both in meals and in salads.

- Flaxseed is used more in salads.
- Probiotic products are placed on the menus. The inclusion of kefir as a probiotic product in the menus along with ayran and yogurt has gained importance in terms of creating healthy menus. Thus, individuals started to prefer products that are healthier, containing vegetables and fruits, flavored with various spices, and fruit juices mixed with ginger, lemon, apple and carrot instead of pastry-based products.

When the results of this research are evaluated in general, it is understood that the restaurants serving as Fine Dining Restaurants in Istanbul did not make many changes in their menu lists due to the COVID-19 Pandemic, but they supported their menus with some small details. As a result of the feedback received from the businesses interviewed, it has been concluded that businesses have suspended their face-to-face activities due to the pandemic, they have suffered a loss of economic income and the menu lists have remained the same. Only when the reopening of businesses comes to the fore after full closure, it has been determined that the menu lists include some products that have an immune-boosting effect. The aim of the study is to provide data and be a source for some other research related to the subject.

### Declaration of Competing Interest

The authors declare that they have no financial or non-financial competing interests.

### Author Contributions

G. Yılmaz (ORCID: 0000-0002-1882-867X): Methodology, Investigation, Supervision.

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# A Research on the General Knowledge of Pastry Chefs About Food Colorings and Their Awareness of Reading Labels

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## Abstract

Food colorings are substances commonly used to increase the desire to eat by making the appearance of the food more attractive. This study aims to determine the general knowledge of pastry chefs about food colorings and their perception of label reading awareness. For this purpose, field research and focus group interviews were used, and content analysis was applied to the research data. With the focus group interview data analysis, we determined the awareness of pastry chefs towards synthetic food colorings under two main headings (understanding the health effects of synthetic food colorings and food labels reading habit) and two sub-headings. We examined the food colorings used in many boutique pastry products, and, as a result, we observed that the food colorings that are common in the sector are synthetic. In addition, food colorings have been proven to cause behavioral disorders such as sleeping problems and hyperactivity in children, and some food coloring brands also state this information on their labels. As a result of our focus interviews with five pastry chefs who use synthetic food coloring directly in their workplaces, we observed that the knowledge on synthetic food coloring causes behavioral disorders in children is not very common among pastry chefs. We also determined that pastry chefs do not consider the health warnings on food coloring labels. In conclusion, the general knowledge of pastry chefs about food colorings and their awareness of label reading is insufficient.

**Keywords:** Food additives, Food coloring, Gastronomy, Hyperactivity, Pastry chefs.

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## 1. Introduction

People are sensitive to the color of the food they consume; it has been reported by Downham and Collins (2000) that appetite is almost directly related to the person's reaction to color, and this effect can be either positive or negative. The color perceived by the person gives clear information about the taste after consuming the food. Food colorants can be found in liquid, powder, or paste form in many different colors and are used in various pastry products. These colorants can be oil-based or water-based (Rinsky & Rinsky, 2008). The type of coloring to be used differs from product to product. For instance, since chocolate should not be mixed with water, an oil-based color should be chosen as appropriate food colorant (Wise, 2021). In the research by Myint and Kyu (2021), it was found that food colorings are used to make food look attractive, and it was added that they are divided into two categories: natural and synthetic. Natural food

colorings can be obtained from sources found in nature, such as plants (strawberries, blueberries, beets, red peppers, sweet potatoes, saffron, spinach, red cabbage, etc.) and insects (*Dactylopius coccus*, *Coccus lacca*, etc.). Humans have been adding colorants to foods for centuries. Besides, synthetic food colorings are widely used in bakery products, candy, ice-cream, cheese, jelly, jam, as well as, beverages consumed by sportsmen and sportswomen (Martins et al., 2016; Nowak, 2020).

The study conducted by Kobylewski and Jacobson in 2012 emphasizes that most of the tests regarding the safety of food colorings for human health are insufficient; in addition to the evidence on issues such as carcinogenicity, genotoxicity and, hypersensitivity, it has also been reported that these food colorants do not contribute to foods in terms of safety and nutritional value. For this reason, it has been advocated that food colorants used in the food products should be removed from the supply, and it is recommended to replace them with safer food colorants if they are to be used. It

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has been suggested that the authorities responsible for testing food coloring should be much more selective and careful and only well-tested and safe products should be approved (Gallo et al., 2020).

Since the 1970s, the use of synthetic food colorings has been linked with problems such as attention deficit and hyperactivity in children. When the observed behavioral disorders are examined, irritability, sleep disturbance, restlessness, and aggression come to the fore (Stevens, 2014). Researches by Myint and Kyu (2021), Ahmed et al. (2021), Corradini (2019), and Mittal (2020), reported that the consumption of synthetic food colorings has increased and that the largest consumer group is children. Moreover, these colorings cause health problems such as hyperactivity, cancer, and allergies in them. Another study conducted in hotel kitchens focused on the amount of colorant used in hotel kitchens for a better presentation, and also on increasing the use of natural colorants, and it was argued that children's menus should be composed accordingly. Thus, aiming to minimize the negative effects of food coloring on children, the goal is a child-friendly tourism (Hastaoğlu et al., 2018). In another article, it was mentioned that food is a necessity in human life, whereas food coloring is not. In addition, it has been mentioned that food colorings are used to add attractiveness to food, and it is emphasized that products containing food colorings can be chosen by consumers voluntarily. On the other hand, it has also been reported that consuming artificial food dyes is not harmful to health (Clemens & Pressman, 2018).

In this study, the perceptions of pastry chefs who use food coloring frequently and widely in their kitchens were evaluated, as well as the context in which they pay or do not pay attention to the content when purchasing food coloring.

## 2. The theoretical and conceptual framework

Food colorings are described by the Codex Alimentarius as “additives added to give color to food or to regulate the color of food” (McAvoy, 2014). Due to the differences in the chemical structures of many substances that have the property of coloring, they may have different chemical, physical, and physicochemical properties. For example, Sunset Yellow, which is a synthetic food dye, does not change its color as a result of its reaction with acids, and therefore it can be easily used in acidic foods (de Sá et al., 2013). Erythrosine is a red powder or granule and if the food is to be purple, it should be kept in the pH 7 and pH 10 range (Martins

et al., 2016). These features determine what kind of products they will be used for, for what purpose, and in what form (Greenhawt & Baldwin, 2008).

Food colorings are legally classified into two groups: certified and uncertified. All non-certified food colorings are obtained from natural sources. In the 1950s, after synthetic food colorings began to cause diseases in children in the USA, James Delaney began to hold hearings on synthetic food colorings in the US House of Representatives. Through the efforts of Delaney, in 1960, the FDA identified factors to consider when determining whether a color additive's recommended use is safe, as well as specific conditions for safe use that must be included in the listing regulation. As a result, such natural food colorings were removed from the list of certified color additives by the FDA in 1960 and included in the list of priority and continuous use (U.S. Food and Drug Administration, 2017). Certified food colorings are synthetically sourced and divided into colorings and pigments; colorings are soluble in water, pigments are not (Grumezescu & Holban, 2017).

### Natural food colorings

In the book by Delgado-Vargas (2002), “natural food coloring” is defined as the aroma and coloring component obtained from finely ground-dehydrated fruits. Natural food colorants are also defined as colors used in foods that are obtained from vegetables, fruits, various plants, and different microbiological sources. These colorants, which can be prepared at home, can also be purchased and used. Examples of natural colorants are shown in Table 1 (Hastaoğlu et al., 2018).

Table 1. Some of the natural coloring sources

| <i>Source of coloring</i> | <i>Color</i>  |
|---------------------------|---------------|
| Beetroot                  | Red or pink   |
| Clover nettle             | Green         |
| Spinach                   | Green         |
| Parsley                   | Green         |
| Blackcurrant              | Red/blue      |
| Cherry                    | Red/blue      |
| Red beet                  | Red/blue      |
| Carrot                    | Yellow/orange |
| Orange                    | Yellow/orange |
| Saffron                   | Yellow/orange |
| Caramel                   | Brown         |

In another book by Rinsky and Rinsky (2008), the food colorings obtained from some different natural sources are as follows:

Yarrow: Yarrow is a plant of European origin that is widely grown in America, and its leaves are dried and used to sweeten tea. In addition, it is also known that



Table 2. Contents of some artificial food colorings in the patisseries

| Brand | Code  | Common name | Form of coloring | Color  | Specifying the maximum amount to be used | Warning about effects on children |
|-------|-------|-------------|------------------|--------|--|-----------------------------------|
| A     | E 102 | Tartrazin   | Powder           | Yellow | X  | ✓                                 |
| B     | E 102 | Tartrazin   | Liquid           | Yellow | ✓  | ✓                                 |
| C     | -     | Ponceau 4R  | Liquid           | Red    | ✓  | X                                 |
| D     | E 124 | Ponceau 4R  | Liquid           | Red    | ✓  | ✓                                 |

food coloring is obtained from the flowers of the yarrow plant, which are yellow, pink, or magenta.

**Annatto:** Annatto is the seeds of the achiote plant from which food coloring is obtained. Yellow-red food coloring is obtained by dilution of these seeds in water and then cooking them in oil. An achiote plant is a small shrub plant that grows in tropical climates in America and Southeast Asia and is not consumed directly.

**Carmine:** This food coloring, obtained as a result of drying female cochineal insects, is used to give a deep red color to many products like candies, jellies, etc.

#### *Synthetic food colorings*

The effect of food colorants, which is very effective from the customer's point of view of the product and plays a major role in attractiveness, is a whole with freshness, taste, nutritional value, and incentive. When natural food colorings are examined based on the professional sector, they are reported as unstable and easily perishable. For these reasons, it is known that synthetic food colorings are widely used (Kucharska & Grabka, 2010). Synthetic food colorings are inorganic and synthetically produced food colorings are widely used in many desserts and pastries. The FDA should test the suitability of these food colorings for human consumption (Rinsky & Rinsky, 2008). In addition, the contents and codes of the permitted food colorings are reported in the list created by the European Parliament and Council Directive published in 1994 on synthetic food colorants (Directive, 1994).

In a study on blue food coloring, it has been stated that bright blue is commonly used in foods consumed by children, and therefore, synthetic food colorings cause concern. In this context, products in blue directly create the perception of being synthetic, and the existing belief in this subject is another issue that should not be ignored. As a result, the importance of turning to natural colorants is emphasized in the use of food coloring in various products (Spencer, 2018).

#### *The Labels of Food Colorings Commonly Used in Pastry*

In July 2010, the European Food Safety Authority made it obligatory to include the phrase “may have a negative impact on the activities and attention of

children “on the labels of foods containing synthetic colorings” (Kanarek, 2011). No similar information could be found in any official publication in Turkey. To obtain information within the scope of the research, the labels of food colorings of various brands and forms of colorants were examined in the markets that everyone and pastry makers could access. It was investigated whether the hyperactivity effect mentioned in the related articles was stated on the labels and whether food label contents were written descriptively. The information about the labels is as follows (Table 2).

#### *Pastry Chefs' Knowledge About Food Colorings and Label Reading Awareness*

Globalization and important developments in food science and technology are not properly understood by society, which often raises concerns among its members. There is a necessity to increase an awareness of reading food labels to eliminate health and food safety concerns. In terms of food safety and public health, food labeling can measure the reaction of both food producers and consumers to safety conditions of products. However, the subject of our study on understanding the knowledge of pastry chefs about food colorings and their awareness of reading food labels, has attracted the attention of very few researchers. Awareness of food label reading will enable pastry chefs to make informed decisions about food coloring choices (Danilola et al., 2019).

### **3. Method**

In this study, one of the qualitative research methods - focus group interviews, was applied., using the effect of group dynamics to obtain in-depth information and generate ideas through discussions between a small group and the leader (Adler et al., 2019). In this method, researchers can use focus groups to develop pre-existing knowledge about a known subject, or they can also use them to gain new ideas and information by focusing on the subject from another angle (Styśko-Kunkowska et al., 2018). Professional pastry chefs from Istanbul, who worked before as pastry chefs in various regions of Turkey, formed the main population of the research. The research sample was created using the



highest diversity method, and the participants were optimally selected. Thus, it was ensured that a homogeneous participants group was formed by considering their common characteristics regarding the research subject. In this way, it was ensured that the data obtained from the study would be more inclusive and useful in terms of content (Dilshad & Latif, 2013).

In the research, interviews were conducted using a semi-structured questionnaire to evaluate how consciously five pastry chefs use food colorings. The voluntary participants were asked to answer six questions on food colorings, and by evaluating their answers (with consent from the participant), the framework of the research was formed. The focus group interview questions were based on the research of Makeen et al. (2021) It was observed that the awareness of participants about negative effects of long-term use of food colorings on health was limited, and education on negative effects of synthetic food colorings on children was emphasized. Questions (designated as Q) have been revised based on the information obtained from researches (Rinsky and Rinsky, 2008; Kanarek, 2011; Stevens, 2014) for pastry chefs who use food colorings directly, and additional questions were also added to support the research. In addition, within the scope of the study, it was also sought to analyze whether the pastry chefs took information on food coloring labels into account. Therefore, the Q6 was added to the focus group interview. Also, demographic information about participants was also obtained. The questions addressed to the participants are as follows (Table 3).

In this study, the content analysis method was used to evaluate the focus group interviews data, as well as systematic analysis of a text based on making repeatable and valid inferences. To ensure the validity of the results, maximum attention was paid to obtaining the data objectively. For a study to be reliable, its reproducibility must be ensured, and the

same analysis must be done at different times and conditions. This means that another researcher obtains the same results under the same conditions. To ensure the reliability of the analysis results, the content of the interview was given to three different researchers and similar inferences were taken from them (Drisko et al., 2016).

A field study was conducted to find out the food colorings used in the boutique patisseries. Field research is a qualitative research method in which the researcher directly observes environmental conditions in the present (Feldman, 2019). The scope of the field research consisted of visits to five suppliers and five boutique patisseries.

#### 4. Results and Discussion

Field research has shown that synthetic food colorings are generally used in boutique pastries, and it has been observed that there are health warnings on the labels of some brands. It is thought that the main reason pastry chefs use synthetic food colorings instead of natural food colorings is that they cannot produce standard and attractive products with natural food colorings (Francis, 2002). Analysis of focus group interview data showed that pastry chefs' general knowledge of food dyes and their awareness of label reading was not sufficient. In addition, it was determined that the information that synthetic food colorings cause behavioral disorders in children was not known by the pastry chefs.

The analysis of the data from the focus group interviews demonstrates that the awareness of pastry chefs towards synthetic food colorings was gathered under two main headings and two sub-headings (Figure 1). The content analysis of the constructs and focus group interviews data, was evaluated in detail below.

Table 3. Focus group interview questions

| No | Questions  |
|----|--|
| Q1 | Please write down in detail which food coloring products you use.  |
| Q2 | Do you know the names of the coloring substances found in some foods and beverages? Please write down the contents of food colorings in general, the source of these substances, and any other information about these colorings you may have. |
| Q3 | It has been proven that coloring substances can cause some behavioral changes in children. Do you have any information about this and other adverse effects caused by artificial food colorants? Please explain.                               |
| Q4 | Do you check the labels printed on food and beverages containing colorants before purchasing them? If so, please explain why you are doing this.   |
| Q5 | Would you buy or use coloring substances again if you knew they caused behavioral changes in children? In addition, what can you suggest as an alternative or solution to this situation?  |
| Q6 | Do you pay attention to the information on the labels of food colorings on the shelves? Is there any information that interests you in particular? Please explain briefly.   |

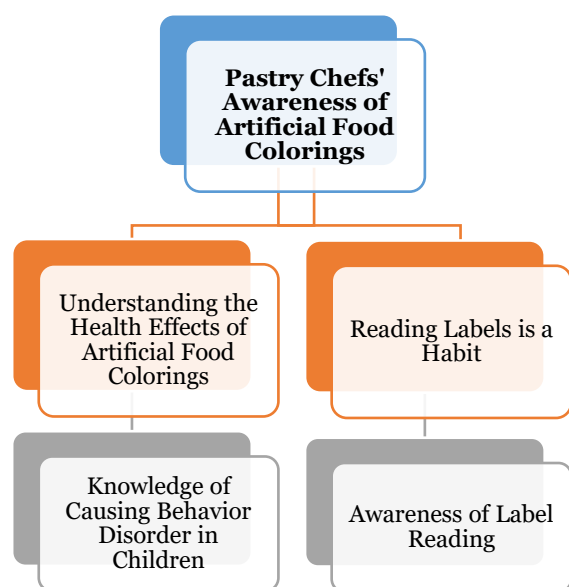


Figure 1. Constructs of pastry chefs' artificial food coloring awareness

Firstly, the demographic information of the focus group interview participants showed that the average age was 37, and all of them were females. All participants stated that they used food colorings at work. The questions answered in-depth by the participants revealed that the products in which food colorings were used in bakeries were sugar fondant, buttercream, royal icing, some cheesecake fillings and sauces (to give a more attractive appearance), chocolate, candy, macarons, marshmallows, writing on cakes and cookies, powder colorings to add dimension to sugar flowers, ice cream, batter of some sponge cakes (such as red velvet cake or rainbow cake), and meringues.

Considering the pastry chefs answers to Q2 about the content information of the colorings, it was observed that the names of the main colors (tartrazine, ponceau 4R, and brilliant blue) were prevail. In addition, all pastry chefs participating in the focus group interviews reported that they knew that those food colorants were not from natural sources and that they could be unhealthy.

According to participant 1, she was not aware of a food coloring agent causing any disorders in behavioral change in the children. In addition, she stated that synthetic food colorings are carcinogenic and unhealthy, but these negative effects can occur with the amount of use, as in many foods. She also added that on the labels of many food colorings, it is written the maximum amount to be used. According to participant 2, similar

to participant 1, she was not aware that food colorings could cause behavioral disorders in children, and added that when used excessively, they can be harmful to health and carcinogenic, as many packaged foods. According to participants 3 and 4, they were not aware of the effect of food colorings on children in this way, like the previous participants. In addition, they added that food colorings can be as unhealthy as any food with additives, and the level of consumption is important in this regard. Unlike the other participants, participant 5 reported that she usually followed the articles related to her job and that she read some articles about how food colorings can cause problems such as hyperactivity, sleep problems, and behavioral disorders in children. She also stated that she knew that these food colorings could have a cancer-triggering effect. She also stated like all other participants, that the use and consumption of food coloring is the determining factor for the negative effects on children's well-being and health in general.

When the participants were asked whether they check the labels printed on food and beverages containing colorants before purchasing, and if they do, for what purpose, the responses of the participants were as follows: Participant 1: *"I look at the calories and sugar amount (when I want to eat healthy), I guess I don't pay much attention to whether there is coloring or not"*. Participant 2: *"Yes, I always read the back of the packages because I eat naturally and healthily, I do not prefer colored ones"*. Participant 3: *"Yes, I always check. I do my shopping according to the expiry date, whether there is a harmful oil (such as palm oil) or another additive in the ingredients"*. Participant 4: *"Unfortunately, I don't, I know it actually needs to be looked at, but I'm not a very conscious consumer in this regard"*. Participant 5: *"Yes, I checked the labels. I generally try to pay attention to whether it contains synthetics, its expiration date, and what is in it. I want myself and my family to consume foods with good content"*.

When the answers to Q5 were examined, the participants stated that they would not prefer to buy and use food colorants that cause behavioral disorders in children under normal conditions. However, they indicated that they have to continue on this path until well-pigmented natural food colorings come to the market, because food colorings, which are an important part of their business, have a significant difference with the colorants obtained from natural sources and the desired result cannot be obtained. Apart from the option to gain a strong position in the sector with the content and effects of natural food colorings, the changing

trends in the pastry sector were also highlighted by participants 1 and 4. While sugar fondant cakes were more common 5 years ago, nowadays cakes with cream on the outside area are in the foreground, which shows that the interest in sugar fondant has decreased. Over time, there is also the possibility that paints will be used less or not at all in the sector, depending on the demands of people. In addition to the thoughts of other participants, participant 5 answered Q5 in this way: *"I think that our customers are conscious consumers, and they make their children consume food-colored products consciously and in a controlled manner. The thing that draws attention on birthdays is that the sugar fondant of the cake is put aside. It is highly visual. Of course, some like the taste. We would revise our colorants in case there are naturally sourced colorings in the market that we can obtain the color tones we obtain for current food colorings."*

In addition, participants with children added that they do not allow their children to consume food coloring either. Factors those participants pay attention to on the labels of food colorants are evaluated and the answers to Q6 are examined. The main points are as follows: compliance with food codex, expiry date, the maximum amounts allowed to be used, water or oil-based, non-toxic statement.

Food colorings are added to change colors lost during preparation or to make food look more appealing (World Health Organization, 2018). As mentioned in the article by Downham and Collins (2000), synthetic food colorants are used in a wide variety of products in the boutique pastry sector. However, studies funded by the Food Standards Agency (FSA) of some countries, such as the United Kingdom, have proven that children show behavioral disorders. For this reason, synthetic food colorings such as tartrazine, quinoline yellow, sunset yellow FCF, azorubine or carmoisine, ponceau 4R and allura red AC have been banned from use in foods since 2008. Today, many other synthetic food colorings are used in a wide variety of foods that tend to be brightly colored, including desserts, cakes, ice cream, and soft drinks (Bakthavachalu et al., 2020).

Apart from the products that clearly contain food coloring, it has also been determined that in some products (such as cheesecake filling and sauces), food coloring can be used without customers being informed, just to increase the appeal of the product, as Downham and Collins (2000), Myint and Kyu (2021), Clemens and Pressman (2018), Kucharska and Grabka (2010) pointed out in their articles. We think that manufacturers should inform customers about food colorings they use.

The issue of whether synthetic food colorings cause health problems, especially in children, has been discussed for many years (Shanmugasundaram & Rujaswini, 2019). In addition, with the increase in its use in the last decades, it continues to be of increasing concern to the public. The effect of synthetic food colorings on children's behavior has been studied for a long time, with various data obtained from research (Trasande et al., 2018).

According to the results of our study, pastry chefs who work in the field of boutique pastry are aware of the ingredients of the food colorings they use and are aware that they are not natural and may be unhealthy (for instance, they can be carcinogenic).

Except for one research-loving pastry chef, other pastry chefs do not have the knowledge that food coloring can cause behavioral disorders in children, although most of the food colorings are written on their labels. These pastry chefs, who have been in the food production sector for many years, are expected to approach additives more consciously.

As shared in the research by Kobylewski and Jacobson (2012), in areas where food colorants should be added into the food product, it is recommended to use colorings with safe content. The industry will continue to use these synthetic food colorings until natural ones are fully replaced by synthetic food colorings. It is also emphasized that the possibility of less or no use of these synthetic food colorings can be shaped by different trends emerging in the pastry field (such as the fact that only buttercream cakes are more popular than sugar fondant cakes).

Some businesses that produce low-cost pastry products ignore food safety rules and prefer synthetic dyes that are not suitable for food because they are cheap and give more color. For this reason, pastry chefs' knowledge of synthetic food dyes and their awareness of label reading becomes much more important for solving the problem. In this context, chefs need to read the food coloring label and know the E code on the product label. Contrary to the disinformation spread on social media about the E code, the E code is an international symbol given to food additives whose toxicological research has been completed and whose harmless dose has been determined (Martins et al., 2016). We think that important information about synthetic food dyes should be given to kitchen chefs by food scientists.

## 5. Conclusion

In conclusion, it has been determined that the general knowledge of pastry chefs about food colorings and their awareness of label reading are not sufficient. In this context, it has been observed that the knowledge that synthetic food colorings cause behavioral disorders in children is not known by pastry chefs. In addition, it was concluded that the information on the labels on the food colorings was not taken into account by the pastry chefs. It is foreseen that synthetic food colorings, which can have various negative effects on health, will never be used in the future, given the trend towards healthy products in pastry industry.

## Declaration of Competing Interest

The authors declare that they have no financial or non-financial competing interests.

## Author Contributions

M. Doğan (ORCID: 0000-0001-6391-4887): Definition, Conceptualization, Methodology, Validation, Investigation, Writing – Review & Editing, Supervision.

P. Olgay (ORCID: 0000-0003-1768-3613): Definition, Formal analysis, Investigation, Writing – Original Draft.

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# How Color-Harmony on a Food Plate Affects Consumers' Perceptions?

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## Abstract

The aim of the present research was to explore consumers' color-harmony preferences on a food plate in relation to four different criteria; aesthetics, taste, healthiness, and satiety. With respect to this aim, four different food plates were designed based on four color-harmony types used in fine arts – analogous, complementary, triadic and quadratic. The sample of the study consisted of 1.162 participants from Turkey who responded to an online survey including pairs of color-combinations and reported their preferences in terms of the selected criteria. The results were analyzed using Cochran's Q Test and Scheffe Test. The results clearly demonstrated that people respond differently to meals comprising of different color-combinations. One major finding was that people seemed to find quadratic food-color harmony as the least tasty and healthy food even though they found it aesthetics. In correspondence to the results of several other studies, the present study found that attractiveness of food plates could be increased through the use of more colors to a certain level. Food plates with quadratic color-harmony were detected to be the least tasty and healthy and less filling by Turkish consumers.

**Keywords:** Food-color preference, Visual aesthetics, Food-color harmony, Food plating.

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## 1. Introduction

People make judgments and decisions every day. They make decisions about wearing blue or green dress, buying this or that car or facing this or that direction in a park for varying reasons. Most of the time these judgments and decisions are based on their internal aesthetic responses to varying aspects of the world surrounding them (Palmer et al., 2013). Food is one essential part of the daily world around us and with no doubt everyday aesthetics is tightly associated with food (Paakki et al., 2019). People's aesthetic considerations about food preference are quite mundane, ubiquitous and therefore are worth of scientific interest and importance (Palmer et al., 2013). People's aesthetic responses to food has much impact on their daily lives but surprisingly very little is known about them. While the study of aesthetic preference is actually one of the oldest topics among psychologists and sensory scientists, interest in food-preference has started to gain importance over the last few years or so. Generally

visual aesthetics of food has been studied in terms of different plating arrangements. The research on visual composition of food that has been published to date mainly focuses on design elements such as visual balance of food plate (Banich et al., 1989; Gordon & Gardner, 1974; Locher, 1996; McManus et al., 1993; Spence et al., 2019; Velasco et al. 2016); visual orientation (Spence et al., 2019; Youssef et al., 2015), neatness (Zellner et al., 2011), and food color (Lee et al., 2013; Spence et al., 2010)

Color preference is also an important aspect of visual experience that influences a wide range of human behaviors: buying cars, choosing clothes, decorating homes, designing webpages, etc. (Palmer & Schloss, 2010). Decades of research on color-preference of humans have described it as a 'bewildering, confused and contradictory' process (Lee et al, 2013). According to a couple of researches (Hurlbert & Ling, 2007; Palmer & Schloss, 2010; Schloss et al., 2011) color preference of people is closely connected to color-associated objects meaning that

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people like or dislike colors associated with objects they like or dislike. For example, blues and cyans may be universally liked because clear sky and clean water are universally appealing, and browns and olives may be universally disliked because feces and rotting food are universally disgusting (Palmer & Schloss, 2010). Color preference of people also varies according to educational, empirical, cultural effects (Schloss et al., 2013) and demographics (Hurlbert & Ling, 2007).

### *Food Color Preferences*

An ancient quote attributed to Apicus (first century), states that “the first taste is always with the eyes.” (van der Laan et al., 2011). As the old saying states, food color is an important visual cue that affects our ability to identify a food (Zellner et al., 2014). People use food color as a visual stimulus before tasting it. Additionally they predict its taste before making a decision whether or not to purchase or eat it (Lee et al., 2013). For the first humans on earth food-color was a matter of survival (Palmer & Schloss, 2010). For example, as being one of the rarest colors in nature, blue food was and is still associated with unnaturalness and artificiality. Therefore, food-color is sometimes the most decisive element as an indicator for food selection and evaluation (Abdullah et al., 2004; Afshari-Jouybari & Farahnaky, 2011; Fernández et al., 2005; Lee et al., 2013). Color also affects the identification and acceptability of foods, anticipated safety, sensory quality, and preference (Cardello, 1996; Clydesdale, 1993; Fernández-Vázquez et al., 2011). Appearance of food conveys a lot of information about it. It is a useful tool for people to identify what they are about to eat. It is a visual clue for goodness/ badness, freshness (Clydesdale et al., 1992; Wada et al., 2010; Zellner & Durlach, 2002; Zellner & Durlach, 2003), healthiness (König & Renner, 2018), likeness / dislikeness (Zellner et al., 2004; Zellner et al., 2014).

Food is one essential part of our everyday life, and consequently the aesthetics related to a food plate is tightly associated with our food-color preferences (Paakki et al., 2019). In line with our general aesthetic appreciation of the visual arts, the visual presentation of food involves similar components such as arrangement, centralization, orientation, and color. Over the last decade, a number of sensory scientists, psychologists and food industry professionals have started to take an interest in systematically assessing the visual aesthetics of food plating in line with the general principles of science, art and design (Velasco et al., 2016; Youssef et al., 2015). The rapid growth of interest concerning how a dish is plated in terms of art

and design has been occurred in various areas. While investigating the problem of aesthetic food plating, researches focused on the balance of food (Velasco et al., 2016), linearity (Spence et al., 2019; Youssef et al., 2015), and neatness (Zellner et al., 2011; Zellner et al., 2014).

In terms of assessing the food color as a key component of plate design, there is an intriguing body of research conducted in various settings (restaurants, cafés, science laboratories or online). In this respect, the mapping of color onto taste was analyzed in terms of different dimensions, such as their hue, saturation and brightness (see Spence et al., 2010, for review) and foreground-background color combinations (Spence, 2018; Woods et al., 2016). The majority of the food color research has studied how each food color influenced taste and flavor perception of people (Lee et al., 2013; Saluja and Stevenson, 2018; Spence et al., 2010; Spence et al., 2015). Studies mostly investigated the responses of subjects to single or paired colored samples (Woods & Spence, 2016). However, food on a plate rarely involves one single color in everyday life. Most of the time, more than one color appear on a plate. Besides, colorful food such as vegetables and fruits are more appreciated (Paakki et al., 2019). While the above mentioned studies provide evidence that food color is one of the most important attributes of an aesthetic food plate, they utterly neglect the range of variegations on a food plate.

Given the facts that color harmony is a neglected area of research and no research on the subject in food literature has been detected to date, this study investigated food plates including various color-harmonies rather than one single food color. When there are two or more colors in a design area – in this case food plate- the question of producing a pleasant effect occurs. It is of great importance to create harmonious color combinations to give rise to the pleasing effect. Up to date, the rules of color-harmony have occupied the thoughts of great artists and scientists (Westland et al., 2007). It is well known, for example, that many painters like Van Gogh, Monet, Signac, Kandinsky studied the notion of color harmony and balance, as well as the movie director Wes Anderson’s precise coloration and distinct color scheme. Colors have been of great importance even thousands of years ago that, for example, Egyptian monuments were vividly colored and ancient Greek and Roman sculptures were originally painted with distinct codes of coloration.

Despite many artists, researchers and scientists who have extensively studied color combinations in various

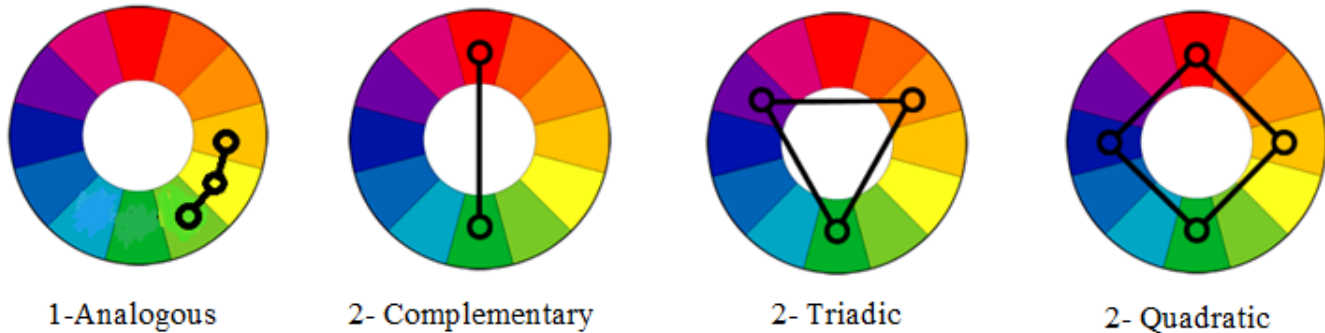


Figure 1. Four basic color harmonies chosen for this study that are applicable to food colors

research areas, surprisingly there has been no attempt by food researchers and professionals to systematically investigate the fundamentals of color harmony while creating aesthetic and pleasant food plate presentations. Worse than that, the association of color with taste has been traditionally based on the intuitions of the creative or designer involved (Spence et al., 2015). In the case of food plating the creators are commonly the chefs and their intuitions are generally directed by a series of 'rules of thumb' (Velasco et al., 2016). One such rule for Turkish chefs, for example, is that sprinkling finely chopped green parsley over almost every varicolored food plate to maintain color harmony. Given the situation about creating harmonious food presentations through various colors, the absence of relevant research on the topic encouraged researchers to apply a systematic approach to the problem. The present research aimed to project insight to the issue of presenting visually appealing plates and to articulate laws of color harmony in arts into food plating. It tested whether the fundamental laws of color harmony in arts and science could be applied to gastronomy industry in terms of food plating. In respect with this aim, four basic techniques for combining colors that could be maintained with edible food varieties were chosen (Figure 1);

1. Analogous color harmony where colors are next to each other on the color wheel (e.g. orange-yellow-green)
2. Complementary color harmony where colors are opposite to each other on the color wheel (e.g. red-green)
3. Triadic color harmony where there are evenly spaced three colors around the color wheel (e.g. green-purple-orange)

4. Quadratic color harmony where there are four colors spaced evenly around the color wheel combining a square (e.g. yellow-red-green-blue)

Since food colors not only convey information about the taste but also help us identify how healthy and filling they are, this study expands its research area and investigates which color combinations are viewed as aesthetics, tasty, healthy and filling.

We hereby report the results of an online questionnaire focused on color harmony aspect of food plating. We tested people's preference for food aesthetics, appetizing, healthy and filling food that varied in terms of the different color combinations of the edible elements on the plate.

## 2. Method

### 2.1. Design and Procedure

As the main investigation subject of this study is very thin on pre-existing research, the closest literature was assessed to construct a measurement tool. The questionnaire has been built based on the existing literature on food plating in aesthetic terms (Zellner et al., 2014) and some quantitative research performed for similar design elements like color (Lee et al, 2013; Paakki et al., 2019; Saluja and Stevensen, 2018; Spence et al., 2010; Spence et al., 2015), balanced presentation (Velasco et al., 2016; Zellner et al., 2011), oblique effect (Spence et al., 2019; Youssef et al., 2015), and background color (Spence, 2018). Initially four dishes matching with four color harmonies were cooked and replaced on a white plate in order to eliminate background color effect. (1) Analogous food plate included carrot, potatoes and cabbage, the colors of which were orange, yellow and green respectively. (2) The plate belonging to complementary color harmony included red tomatoes and green pursley. (3) Triadic





Figure 2. Examples of crystallized images

color harmony was maintained by green mint leaves, purple octopus and orange carrots. (4) Quadratic color harmony comprised of red tomatoes, green leaves, yellow carrots and blue edible flowers.

The next step was taking the pictures of the dishes in the same environment so as to eliminate the brightness effect. Then the photos were crystallized through an image-processor. The idea was to make the food items unidentifiable so that the viewers could not make biased decisions based on their feelings about the food. In other words, the researchers did not want participants to guess the food and become biased. By this way the participants could not second-guess what the researchers were after and they would purely react to the main problem of food-color harmony. Crystallization also enabled researchers to eliminate other factors hue, saturation and brightness aspects of colors. Additionally, the possible effects of other design elements on a food plate like alignment, centralization, linearity, usage of space, shading, etc. on participants' decision process could be taken out through crystallization.

The questionnaire was developed and distributed in Turkish language. All respondents answered all the questions and the order of questions were fixed for all participants. Duration of the questionnaire was on average 2 minutes.

## 2.2. The Survey

The structured online survey consisted of two parts. In the first part, the participants (n=1162) were asked to answer some demographic questions about their age, gender, and occupation. The main purpose of gathering demographic info was to avoid unbalanced clustering of participants of the same group rather than investigating demographic variables' effects.

In the second part of the questionnaire, the crystallized image pairs are shown to participants side-

by-side. Two crystallized images appeared on the screen at each click. The participants were asked to choose one of the two alternatives in response to four different questions; 'Which plate of food is more aesthetic?', 'Which plate of food is more tasty?', 'Which plate of food is more healthy?', and 'Which plate of food is more filling?'. The order of appearance of the image-pairs and the different questions were randomized. Examples of the two-crystallized images next to each other are given in Figure 2. For each question, six pairings of color combination were asked to participants. In total 24 pairings were asked to participants. Respondents were asked to choose one of the two pictures on the following variables: aesthetics, appetizing, healthiness, and satiety.

## 2.3. Sampling and Data Collection

Data were collected using a web-based questionnaire from 13 March, 2020 through June 6, 2020. Before being distributed to the main sample, the questionnaire was pilot tested and finalized after minor revisions. A convenience sampling process took place and researchers used internet to recruit respondents by mass e-mailing and sending out the survey link to several communities and groups that had many members. Since the questionnaire was designed in a simple structure, the method of self-completion was chosen.

## 2.4. Participants

The dataset reported in this study consists of the opinions of 1.162 Turkish participants. All the participants who took part in the online questionnaire were informed about the aim and nature of the study through a cover page at the beginning.

## 2.5. Data Analysis

Statistical analyses were performed using SPSS 21.0. Initially, descriptive analysis was conducted in order to sketch the socio-demographic profile of the

respondents. Cochran's Q Test, an extension of the McNemar test, was used in order to assess differences in matched sets of four dimensions. Cochran Q test enabled researchers to test the differences on dichotomous independent variables that were paired color harmony combinations, between four groups; aesthetics, taste, healthiness and satiety. The results of Cochran's Q test revealed significant differences for all four dependent variables, in order to find out which color-harmony types were significantly different from each other a post-hoc test Scheffe was used.

### 3. Results

#### 3.1. Sample characteristics

The sample is a good representative of Turkish population and it reflects main socio-demographic characteristics. The sample of 1.162 participants had a fair distribution of gender (females;  $n=723$ , 62.2% and males;  $n=439$ , 37.8%) with a prevalence of females. However, the relatively high numbers of females were within tolerance intervals and did not seem to influence the results. The participants were almost age-balanced, with a small preponderance of 21-30 age segment (33.9%,  $n=395$ ). Regarding occupation, more than half of the respondents were full-time employees (51.9%,  $n=603$ ), and a considerable amount 29.2% ( $n=339$ ) of them were students.

#### 3.2. Preferences for Color Harmonies

Furthermore, in order to assess which color-harmony was more appreciated in terms of aesthetics, taste, healthiness and satiety variables, respondents were asked to choose one of the two color-harmonies. This part presents the results of the Cochran Q and multi comparison Scheffe Test conducted based on these

variables.

Based on the results of Cochran Q test, a statistically significant difference between the color-harmony types for each of the dependent variables (Aesthetics;  $p=.001$ ,  $p<.001$ ; Taste;  $p=.000$ ,  $p<.001$ ; Healthiness;  $p=.003$ ,  $p<.01$ ; Satiety;  $p=.000$ ,  $p<.001$ ) were detected. At this point it is very important to note that as Table 1 includes the measures of occurrences rather number of respondents,  $f$  values are approximately three times higher than number of individuals. In other words, since the respondents were asked to compare each color harmony variation with the other three harmonies, the results appeared to be higher than actual number of respondents. A post hoc test, Scheffe was carried for additional exploration of the differences among multiple groups in order to find out which color-harmony types were significantly different from each other. The results indicated that triadic and quadratic color harmonies (Group 3,4) were both considered more aesthetics than analogous and complementary color harmonies (Group 1,2). More specifically, a food plate designed with three or four colored food items is found more aesthetic and appealing than single or two colors dominated food plates.

According to the post hoc test results regarding 'taste' dimension, it can be stated that quadratic color harmony (Group 4) was significantly the least tasty type ( $f=1.230$ ), while analogous, complementary, and triadic color harmonies (Group 1,2,3) were found to be more delicious.

Concerning the participants' responses based on 'healthiness' dependent variable, food plates with quadratic color harmony (Group 4) were detected as the least preferred ( $f=1.149$ ). Food plates with analogous, complementary, and triadic color

Table 1. Results of Cochran Q and Scheffe tests

| Dependent Variables | Independent Variables | $f$   | %     | Chi-squared | $p$     | Multiple Comparisons |
|---------------------|-----------------------|-------|-------|-------------|---------|----------------------|
| Aesthetics          | Analogous             | 1.303 | 18.69 | 1,930,805   | .000*** | 1,2 - 3,4            |
|                     | Complementary         | 1.096 | 15.72 |             |         |                      |
|                     | Triadic               | 2.789 | 40.00 |             |         |                      |
|                     | Quadratic             | 1.784 | 25.59 |             |         |                      |
| Taste               | Analogous             | 1.818 | 26.08 | 249,347     | .000*** | 1,2,3 - 4            |
|                     | Complementary         | 1.759 | 25.23 |             |         |                      |
|                     | Triadic               | 2.165 | 31.05 |             |         |                      |
|                     | Quadratic             | 1.230 | 17.64 |             |         |                      |
| Healthiness         | Analogous             | 1.987 | 28.50 | 489,401     | .003**  | 1,2,3 - 4            |
|                     | Complementary         | 1.927 | 27.64 |             |         |                      |
|                     | Triadic               | 1.909 | 27.38 |             |         |                      |
|                     | Quadratic             | 1.149 | 16.48 |             |         |                      |
| Satiety             | Analogous             | 2.774 | 39.79 | 2,616,752   | .000*** | 1,2 - 3,4            |
|                     | Complementary         | 2.216 | 31.78 |             |         |                      |
|                     | Triadic               | 1.046 | 15.00 |             |         |                      |
|                     | Quadratic             | .936  | 13.43 |             |         |                      |

harmonies (Group 1,2,3) were considered healthier than quadratic color combination.

In terms of 'satiety' variable, results appeared to be same with findings of aesthetics variable. In this regard analogous and complementary color harmonies (Group 1,2) were both considered more filling ( $f=2.774$  and  $f=2.216$  respectively) than triadic and quadratic color harmonies (Group 3,4).

## 4. Discussion

This study provides insights into the preferences of Turkish individuals for color harmonies in terms of different attributes— aesthetics, taste, healthiness, filling- of food plates. In this perspective, participants' ideas about food color harmony types were investigated. Given the evidences regarding color-harmonies' influence on pleasure related features, taste, healthiness and satiation, the results pertaining to each of these are interpreted separately in this section.

### 4.1. Aesthetics in food color

The term 'aesthetics' was not explained or defined to the respondents of this study; therefore, the respondents used their own personal interpretation of the term. In accordance with the Turkish vocabulary, in which the word 'aesthetics' refers to beauty, pleasantness, and likeness (Turkish Dictionary, n.d.), 'an aesthetic food plate' is regarded as something beautiful, pleasant and linked to sensory experiences. The present study revealed that the basic requirements of aesthetics in food plate were the existence of triadic and quadratic color harmonies. Food plates including analogous color harmony in which there are three neighboring colored edibles and food plates with complementary color harmony in which there are two contrasting colors are found to be less pleasant and beautiful compared to triadic and quadratic color combinations. Most of the respondents considered colorful food plates as pleasant and beautiful. This result is in line with Paakki et al., (2019)'s study findings showing that people prefer colorful food, and colorful food was considered attractive and pleasant. In contrast, colorless food that consisted of three neighboring colors or two contrasting colors were not considered equally aesthetics in line with the existing literature.

An interesting finding of this study reveals that complementary color contrasts such as red tomatoes and green salads, were not always the most aesthetic and beautiful alternative, contrary to traditional belief and existing literature (Paakki et al., 2019). When

people were provided with more colors on the plate, they seemed to have a clear preference for triadic and quadratic color harmonies with three or more contrasting colors over two contrasting colors. Therefore, it can be stated that the more colors and contrasts exists, the more beautiful and pleasant the food plates become.

### 4.2. Tasty and healthy food colors

Statistical analyses performed for 'taste' and 'healthiness' variables suggested that analogous and complimentary color harmonies were more appreciated in visual representation of foods. In this study analogous color harmony was maintained through yellow, green and orange dominant foods. This is a result worth to be discussed in line with the findings of an earlier and a relatively closer research to this study. In their studies aimed to assess the association between color pairings and basic tastes, Woods and Spence (2016), detected yellow-green color pairing having the highest percentage of sour taste association, However, Turkish respondents appreciated it as tasty and delicious. This finding lends to raise a new research question about a possible relationship between sour tastes and deliciousness of Turkish consumers. More research is thus needed in order to detect alternative explanations for this possible association.

The results indicate that quadratic color harmony exerts a significant negative influence over 'taste' and 'healthiness' criteria. More specifically speaking, respondents of this study did not prefer food plates with colorful appearance as 'tasty' and 'healthy'. This outcome was quite interesting even though it was regarded as one of the aesthetic food plate presentations. The possible reasons to this are discussed under a separate 'quadratic color harmony' heading below.

### 4.3. Filling food

The major conclusion that derives from 'satiety' variable is the respondents' appreciation of ordinary food color harmonies. Food plates that comprises of neighboring or contrasting color harmonies were perceived more satisfactory in terms of making oneself full. Analogous and complimentary food color combinations belong to everyday aesthetics as they are typically colored, ordinary, and unsurprising. These attributes are considered important at an ordinary meal where the main concern is to get full. In addition, those color combinations can easily be maintained with everyday food. In the case of Turkish cuisine, most of the everyday dishes' appearances fall into these color-





Figure 3. Examples of crystallized images

combination categories. An example of a traditional Turkish lunch buffet that offers basic and ready to serve Turkish food to its consumers is given in Figure 3. As seen most of the dishes belong mainly to analogous and complimentary color-harmonies and do not have much color variability and diversity. The dominant colors are mainly red, green and yellow.

#### **4.4. Quadratic food color harmony: Neither tasty nor healthy.**

A further interesting finding in this study is that quadratic color harmony in which there are four different colors –yellow, red, green, and blue– on the plate is considered as the least tasty and healthy meal compared to food plates with three or less color pairings. This might derive from three possible reasons: First, is the existence of blue on the plate that included quadratic color harmonious food. Although blue is a primary color like yellow or red, it is the rarest food color and sometimes it seems unnatural. In their natural state not many food has blue color, therefore blue raises the suspicions of artificial and synthetic coloring. For the majority of consumers, naturalness in food products is important and natural foods are supposed to be free from artificial colorings (Román et al., 2017). Blue is considered as an appetite suppressant thus many diet plans suggest the use of blue color in the dining environment like blue plates, blue tablecloths, blue lightning, etc. At this point it is important to note that peoples' associations with blue color are

undoubtedly changing. An interesting example given in a study conducted by Spence et al. (2015) stated that although blue color was an absolute no-no in the market place and would never succeed during 70's and 80's, nowadays, by contrast, blue drinks were reasonably common in the drink aisles. Interestingly in this study, despite this changing trend, results with Turkish participants did not change in the same way. Turkish people might not be still ready to accept this changing trend.

Second reason might be because of the relationship between colors and tastes that had been found in many studies (Koch & Koch, 2003; O'Mahony, 1983; Spence et al., 2015, Tomasik-Krótki & Strojny, 2008; Wan et al., 2014). It is evident in the literature that people assign colors to tastes. For example red color was found to be associated with sweet, and green color with both bitter and sour. Associations were also documented between yellow and sour, as well as between blue and salty. In this study quadratic color harmony comprised of food in four different colors that were yellow, red, green and blue. This might result with four different assigned tastes on the same plate which might confuse participants' minds especially those who do not seek for variety.

Third reason might be related to increased surprisingness attribute on the food plate. In the case of Turkish food when more colors are added, the food becomes away from being ordinary, typical and difficult

to identify. Therefore the food might be perceived risky and unhealthy. This is a result that appeared to be different from a couple of previous studies (Wadhera & Capaldi-Philips, 2014; Paakki et al, 2019) suggesting the idea that color variety and colorfulness in food would add to the variety and diversity of people's diet, thus people could be enticed to eat more healthily. Average color variety in food would increase the consumption of varicolored vegetables (König & Renner, 2018) and having more vegetables in one's diet was associated with a healthier diet. Therefore, it may be concluded that people would prefer more colorful plates to a certain extent when they make a decision about their taste and healthiness. If that level is exceeded -in this case four quadrant colors are served- they would not favor the food as tasty and healthy no matter how visually appealing it is.

## 5. Conclusions

This study aimed at characterizing people's aesthetic responses to color pairs in terms of which color combinations were preferred to be more aesthetics, tasty, healthy and filling. The results revealed that people have differing preferences for different food plates that were designed with various color combinations. This is the first published empirical evidence that color-combination on a food plate affects people's attitudes towards its pleasure-related features, taste, healthiness, and satiety attributes. In correspondence to the findings of several other studies (Paakki et al., 2019; Wadhera & Capaldi-Philips, 2014), this study found that attractiveness of food plates could be increased through the use of more colors. However, this paper detected a limit to this colorfulness. Too much color like in quadratic color-harmony are found to be less appealing to consumers in terms of taste and healthiness. Especially food plates having quadrant colors were considered as the least preferred food when the aim was to get full.

Both theoretical and practical implications emerged from this paper. At the theoretical level, this paper adds to the literature a totally new research area that combines gastronomy, art and science. Since existing literature has been detected on preference for food color harmonies, this study is in a position to become the point of reference for future studies on the same subject. In terms of practical implications, this paper informs Turkish food professionals mainly chefs, food and beverage managers, researchers, writers on how color combinations are viewed by consumers. Given the impact of various color harmonies on the perception of aesthetics, taste, healthiness and satiety, these results

should be of great interest to those working in a number of sectors. For instance, chefs, dietitians, restaurateurs, caterers, the tremendously increasing number of food bloggers and social media influencers should all be able to use such insights in order to optimize the appearance of their food images and products on their food plates, web sites, social media accounts, packages, etc. In addition, results suggesting that food color combinations on a plate affects consumers' perception of taste, healthiness, and satiation attributes of a meal, should be of interest to those wanting to loose or gain weight. For instance, an obese patient who needs to eat less but wants to feel full at the same time, should avoid many colors (in this case quadratic color harmony) on plate and prefer plates that has two or three neighboring or contrasting colored food items on it. Meanwhile, gaining a better understanding of the importance of color-combinations on food plate should be relevant to chefs in order to question their own food plating approaches that might neglect the perceptions of consumers. For example, the result stating that more colors on a plate increases the perception of visual aesthetics but decreases the message of being tasty and filling should be of their great interest while designing and decorating their dishes and menus.

## 6. Limitations

It is of great importance to note that small lightness and saturation differences between colors of the food cooked may have reduced the harmony of the pairings. Due to various factors such as nature of the food, cooking temperatures and techniques, and technology used in this study, minor deviations in colors might have arisen. An adjustment can perhaps be made for this unavoidable condition through more precise measurement tools like using images designed in laboratory settings and stabilizing hue, brightness and saturation values.

Although there is a strong relationship between color harmony and color preference, they are different concepts (Ou et al., 2004). Theoretically, people's responses to color combinations might be of question whether they are the sum of responses to each individual color on the plate or a response to one of the colors, particularly to the strongest single color in the harmony (see Woods & Spence, 2016; Woods et al, 2016 for details). Another possibility here is that might be actually some memory prompted by a single color or a color-combination due to psychological and symbolic meanings of colors (Spence et al., 2015).

It is also important to keep in mind that there are no universal laws of color harmony and ideas about color harmony shift over time and between cultures and are application-specific as Westland et al. (2007) states. The findings of this study are relevant to a specific group of people and time. Therefore, the results are subject to change. The hope here is that the method outlined here could be used in the future to address the preferences of different samples belonging to different populations.

## 7. Recommendations for future studies

As being the first study to study color combinations' preference on food plate, this study is a totally new subject for future trials in varying societies, economies or environments. The discoveries of this study are relevant and useful for mainly Turkish gastronomy professionals. It should be noted that these findings have to be dealt with caution and the generalization of conclusions should be avoided, as it is quite evident in the existing literature that perceptions of beauty and harmony are strongly influenced by nurture and culture (Kuehni, 2005; Westland et al., 2007).

This study has chosen to collect its data through an online questionnaire due to limitation costs of the researchers. Additionally data collection was done during Covid-19 pandemics in Turkey. This was a period when the restaurants were either closed or limited their number visitors in order to maintain social distancing. Further studies that have higher budgets can investigate the subject in a physical setting (for instance, in a restaurant) through serving real food samples instead of showing food plate images to participants.

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### Declaration of competing interest

The author declares that there is no conflict of interest.

### Author Contributions

D. Akdeniz (ORCID: 0000-0001-8572-5438): Conceptualization, Investigation, Methodology, Visualization, Writing-Original Draft Preparation, Editing, Resources.

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# Tourist Diners' Demographic Characteristics and Neophobic Tendencies to Local Cuisine in Botswana

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## Abstract

An attempt to explore the influence of demographic characteristics on the food neophobic tendencies of diners is undertaken. Using independent sample t tests and analysis of variance, the influence of age, gender, nationality and the level of education, on the perceived avoidance of traditional *Setswana* cuisine consumption was investigated. Two hundred and forty nine diners from 47 restaurant facilities in Gaborone formed the sample. Key findings from the study reveal that, on average, (though statistically insignificant), male respondents experienced higher levels of Setswana cuisine neophobia than female diners. Furthermore, the paper noted that diners above 50 years of age reported significantly higher levels of neophobia than lower age groups. The findings also indicate to some extent that diners may not necessarily be compelled to taste local cuisine based on familiarity. The paper concludes by suggesting the need for more research on the relationship between familiarity and shared cultural contexts, with food neophobia.

**Keywords:** Demographic variables, Food neophobia, Restaurant diners, *Setswana* cuisine.

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## 1. Introduction

An under researched area in tourism, concerning the relationship between tourists' demographic differences and the consumption or avoidance of local cuisine, often termed food neophobia, is explored in this paper. Whilst the topic of food neophobia has received wider attention, amongst children's food preferences (e.g Galloway et al., 2003; Dovey et al., 2008), adolescents and adults (e.g Pliner & Hobden, 1992; Flight et al., 2003) and some cultures (e.g Tuorila et al., 2001; Ritchey et al., 2003), for instance, there is a paucity of research in tourism regarding the empirical investigation of neophobia with local cuisine and its relationship with tourists' demographics. This is an area suggested by Kılıç & Özdemir (2022) as attracting future research consideration. Due to the limited nature of tourist specific literature concerning tourist neophobia and demographic variables, the discussion pursued in this paper benefits from corroboration with non-tourism literature as this was inevitable in some cases.

Local cuisine in this paper is defined as foods and beverages that are 'produced or grown in the local area

or local specialty food that has a local identity' (Enteleca Research & Consultancy Ltd, 2000: 11). In the case of Botswana, this primarily refers to *Setswana* cuisine. Though *Setswana* cuisine shares some characteristics with other cuisines of southern Africa, the cuisine is unique to some extent (English, 2022) and it includes items such as *seswaa* (pound boiled beef), *bogobe* (samp and beans), *serobe* (boiled, diced sweetbreads/offal), *morogo wa dinawa* (bean-leaf vegetable) and *phane* (mopane worms).

The choice and consumption of such cuisine by tourists at any destination is often a function of various variables, such as neophobia. Food neophobia is defined as a reluctance to eat and/or avoidance of new foods (Pliner & Hobden, 1992). It is a physiological reaction to the thought of, and the taste of unfamiliar food. Neophobia is an individual trait that affects food consumption behaviour (Kim et al., 2020; Mak et al., 2012). It varies amongst individuals depending to some extent, on demographic factors such as age and gender (Hwang & Lin, 2010), place of residence (Verbeke & Lopez, 2005) or educational background (Tuorila et al., 2001). In fact, socio-demographic characteristics such as age, gender, place of residence, income, marital status and education, have often been predisposed as

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some of the most important factors determining food neophobia (Iflazoglu & Birdir, 2020). As such, this paper sought to assess tourists' demographic differences regarding traditional *Setswana* cuisine neophobia by age, gender, level of education and nationality. Other demographic information such as income or place of residence, which might have varying influences on neophobia are not considered in this paper, but could provide avenues for future research.

## 2. Literature Review

Food neophobia has often been described as an avoidance of unfamiliar or novel food (Pliner & Hobden, 1992). Food is considered novel if it is new or unique. Pliner and Salvy (2006) describe food neophobia in two ways; 1) as a personality trait that exists on a continuum over which individuals can be placed in terms of their willingness and tendency to avoid or accept food and, 2) as a form of behaviour linked to the avoidance or acceptance of novel foods in a particular situation. Neophobia as a form of behaviour emanates from the consumption of food and beverages at a destination which is often viewed as a physical experience since food is incorporated into the body through eating (Gibson, 2007). As such, neophobia entails actual bodily involvements with unfamiliar environments at the destination (Chang et al., 2011). Although both approaches are important in the study of neophobia, this paper is however only concerned with the trait of neophobia (in terms of willingness and tendencies to avoid local cuisine), amongst tourist diners, than their actual behaviour (that is, their bodily involvement through eating). Very few studies are explicit on this difference. The influence of four socio-demographic variables, i.e. age, gender, level of education and nationality on the tendency to avoid *Setswana* cuisine is explored.

### 2.1. Age and neophobia

Most literature cites that older people have a higher tendency of restricting their food choice to familiar food than younger respondents. Belgians, for instance, of more than 55 years, showed the highest food neophobia score as compared to other age groups. Acceptance of Latin American ethnic foods decreased with age (Verbeke & Lopez, 2005). Although these findings are similar to Tuorila et al. (2001) who noted high food neophobia scores among the elderly, other authors (such as McFarlane & Pliner, 1997), noted that neophobia decreased with increases in age. Because age is a significant determinant of neophobia, it was therefore hypothesised in this study that:

**H1:** There are statistically significant differences in *Setswana* cuisine neophobia amongst the different age groups.

### 2.2. Gender and neophobia

In one study (Edwards et al., 2010), male international students were found to be slightly more neophobic than women. Tuorila et al. (2001) also found men, in general, to be more neophobic than women. In contrast, Amuquandoh (2011) found that male international tourists were more prepared to explore new Ghanaian foods than their female counterparts. Although others (e.g. Fernandez-Ruiz et al., 2013), reported no significant difference between the two genders, this paper hypothesized that:

**H2:** There is a statistically significant difference in *Setswana* cuisine neophobia between male and female diners.

### 2.3. Level of education and neophobia

In a study by Verbeke and Lopez (2005), respondents with higher levels of education had less food prejudices than those with lower education. Even amongst the genders, there were notable differences. Middle aged men who were more educated were less likely to be neophobic than men in other age groups who were less educated (Backstrom et al., 2003). Young less educated females and middle aged less educated males were also found to be more neophobic (Backstrom et al., 2003). Food neophobia was also lower in highly educated respondents (D'Antuono & Bignami, 2012). Therefore the study posited that:

**H3:** There are statistically significant differences in food neophobia amongst tourists with varying levels of education.

### 2.4. Nationality and neophobia

Nationality is also an important influence on neophobia. For instance, there are marked differences between Western tourists and Asian tourists (Dejbakhsh et al., 2011). In Pizam and Sussman's (1995) study, it was also noted that the Japanese, French, and Italians were perceived to avoid local food in the host destination, in contrast to Americans who were perceived to prefer local food. Food neophobia, with other factors, was also found to be a significant factor influencing ethnic food acceptance, amongst Belgians to Latin-American foods (Verbeke & Lopez, 2005). Because of such differences, the following hypothesis was designed:

**H4:** There are statistically significant differences in food neophobia amongst the various nationalities.

The need for research in the culinary tourism sector for improved responsiveness to consumer preferences is one area of study that needs increased attention (Cohen & Avieli, 2004). As such, understanding the trait of neophobia amongst tourists is important in the promotion of local cuisine for tourism purposes.

### 3. Materials and Methods

The present data in this paper, is part of a larger project which sought to assess the consumption behaviour of tourists who dine at facilities offering *Setswana* cuisine in Botswana (Chatibura, 2015). Only the section on demographic factors and food neophobia is presented here. The food neophobia scale by Pliner and Hobden (1992) was adapted for this study and the following statements (some being reverse coded), were used to create the *Setswana* cuisine neophobia variable:

- I don't trust new *Setswana* foods.
- If I don't know what is in a *Setswana* menu item, I won't try it.
- I stick to what I know on the menu.
- I am afraid to eat *Setswana* foods I have never eaten before.
- I am particular about the *Setswana* food that I eat.
- I dine at places that offer foods that I know.

Respondents were selected using purposeful sampling as it provides information-rich cases for use in in-depth studies (Patton, 2001). It is argued that a researcher can learn a great deal about the study under inquiry from information-rich cases (Benoot, Hannes & Bilsen, 2016). As such, visitors to Gaborone who had spent more than 24 hours but less than 12 consecutive months (and hence could be classified as tourists) were considered. The sampling technique helped ascertain that respondents were from a tourism dining background.

The survey was conducted at 47 restaurant facilities listed in two documents, 1) the Botswana Tourism Organisation Database for Gaborone and 2) The list of restaurants in Gaborone obtained from the Commercial Affairs Department at the Gaborone City Council. These facilities were approached during lunch or dinner, since the sampling target was all adult lunch or dinner guests on that particular day, as pre-arranged with management. The questionnaire was administered after completion of the meal. Ethics committee approval was obtained for this study from the Office of Research and Development at the University of Botswana.

In addition to descriptive analysis, Independent sample *t* tests and analysis of variance (ANOVA) were

Table 1. Demographic profile of diners

| Characteristic                   | Detail         | <i>f</i> | %    | <i>N</i> |
|----------------------------------|----------------|----------|------|----------|
| Gender                           | Female         | 81       | 33.8 | 240      |
|                                  | Male           | 159      | 66.3 |          |
| Age                              | < 30 years     | 99       | 41.3 | 232      |
|                                  | 30-39 years    | 111      | 46.3 |          |
|                                  | 40-49 years    | 18       | 7.5  |          |
|                                  | > 50 years     | 12       | 5.0  |          |
| Educational Qualification        | High School    | 6        | 2.8  | 216      |
|                                  | Diploma        | 102      | 47.2 |          |
|                                  | Bachelor       | 78       | 36.1 |          |
|                                  | Master         | 24       | 11.1 |          |
|                                  | Doctorate      | 6        | 2.8  |          |
| Nationality (by name of country) | Botswana       | 192      | 82   | 234      |
|                                  | United States  | 9        | 3.8  |          |
|                                  | United Kingdom | 3        | 1.3  |          |
|                                  | Malawi         | 3        | 1.3  |          |
|                                  | South Africa   | 9        | 3.8  |          |
|                                  | Sweden         | 3        | 1.3  |          |
|                                  | Zimbabwe       | 15       | 6.5  |          |

\* Source: Chatibura, 2015

used to analyse the results. Independent sample *t* tests were used to analyse the influence of gender on food neophobia; the alpha level for the *t* test being set at .05. ANOVA was then used to assess the influence of age, level of education and nationality on *Setswana* cuisine neophobia. Games Howell post hoc tests were also used where necessary. However, the use of such statistical methods on purposive samples meant the findings could not be generalized to a wider population (Chen, 2013).

## 4. Results

### 4.1. Reliability Analysis

The six statements forming the *Setswana* cuisine neophobia scale in this study were tested for reliability using Cronbach alpha. The value of alpha obtained was .7 and was considered acceptable (Andrew, Pederson & McEvoy, 2011).

### 4.2. Demographic Profile of Diners

Table 1 presents the demographic profile of the 240 diners on gender, age, highest educational qualification and nationality.

Table 1 reveals that the majority of participants (46%) were aged between 30-39 years. Most of the

Table 2. Results of analysis of variance (ANOVA) of *Setswana* Cuisine neophobia by age

|                   | Mean (Age)    |                  |                 |               | F (3,225) | Sig. |
|-------------------|---------------|------------------|-----------------|---------------|-----------|------|
|                   | <30<br>(n=93) | 30-39<br>(n=108) | 40-49<br>(n=16) | >50<br>(n=12) |           |      |
| Cuisine Neophobia | 3.06          | 3.25             | 2.81            | 3.75          | 2.95      | .034 |

\* Sig. (p < .05). \*\* Mean score is based on a 5-point Likert Scale, 1= Strongly Disagree, 5 = Strongly Agree.

Table 3. Games Howell post hoc tests for food neophobia by age group

| Age (year)<br>(I) | Age (year)<br>(J) | Mean Difference<br>(I - J) | Std. Error | Sig. | 95% Confidence Interval |             |
|-------------------|-------------------|----------------------------|------------|------|-------------------------|-------------|
|                   |                   |                            |            |      | Lower Bound             | Upper Bound |
| <30               | 30-39             | -.185                      | .136       | .522 | -.54                    | .17         |
|                   | 40-49             | .252                       | .209       | .628 | -.33                    | .83         |
|                   | 50                | -.685*                     | .159       | .001 | -1.13                   | -.25        |
| 30-39             | >30               | .185                       | .136       | .522 | -.17                    | .54         |
|                   | 40-49             | .438                       | .213       | .195 | -.15                    | 1.02        |
|                   | >50               | -.500*                     | .165       | .025 | -.95                    | -.05        |
| 40-49             | <30               | -.252                      | .209       | .628 | -.83                    | .33         |
|                   | 30-39             | -.438                      | .213       | .195 | -1.02                   | .15         |
|                   | >50               | -.938*                     | .228       | .002 | -1.57                   | -.31        |
| >50               | <30               | .685*                      | .159       | .001 | .25                     | 1.13        |
|                   | 30-39             | .500*                      | .165       | .025 | .05                     | .95         |
|                   | 40-49             | .938*                      | .228       | .002 | .31                     | 1.57        |

\* \*\*The mean difference is significant at the .05 level.

diners (66.3%) were male. The majority, in terms of educational qualifications were Diploma holders (47%) and in terms of nationality were from Botswana (82%).

#### 4.3. Age and Neophobia

One-way analysis of variance (ANOVA) was conducted to examine whether there were statistically significant differences among diners in different age groups with relation to *Setswana* cuisine neophobia. The test statistic for ANOVA is the *F* ratio (Kendrick, 2005). The statistic, is used to analyse a variable by another variable that has more than two categories, as with the four age groups identified in this study. The results of ANOVA for age and neophobia are presented in Table 2.

The results of ANOVA revealed statistically significant differences amongst the age groups,  $F(3, 225) = 2.95, p = .03$ . Levene's Test for Homogeneity of Variance was significant,  $p = .004$ . Since Levene's test was significant (that is less than .05) this meant group variances in the sample were significantly different (Field, 2009). As such post-hoc Games Howell tests were used because these tend to offer the best performance where population variances differ (Field, 2009). Post hoc tests (Table 3) revealed statistically significant differences between diners over 50 years (Mean = 3.75, SD = .452), and those below 30 years (Mean = 3.06, SD = .882), those 30-39 (Mean = 3.25, SD = 1.042) and those 40-49 (Mean = 2.81, SD = .75), thus supporting Hypothesis 1.

Diners above 50 years of age reported higher levels of neophobia than the other age groups. There were no other significant differences between the other groups.

#### 4.4. Gender and Neophobia

An independent samples *t*-test, with an alpha level set at .05, was performed on food neophobia and gender. Results are highlighted in Table 4.

The results indicate that on average, male respondents experienced high levels of *Setswana* cuisine neophobia (Mean = 3.18, SD = .994) than females (Mean = 3.15, SD = .869). This finding supports other studies (e.g. Edwards et al., 2010:305; Tuorila et al., 2001:29), where food neophobia was generally higher amongst males than female respondents. This difference however was not significant,  $t(227) = -.188, p > .05$ . As such, the study rejects the hypothesis, H<sub>2</sub>, that there is statistically significant difference in *Setswana* cuisine neophobia between male and female diners.

Table 4. Results of independent samples t-tests and descriptive statistics for food neophobia by gender

|                | Male |      |     | Female |      |    | t     | df  |
|----------------|------|------|-----|--------|------|----|-------|-----|
|                | M    | SD   | n   | M      | SD   | n  |       |     |
| Food Neophobia | 3.18 | .994 | 151 | 3.15   | .869 | 78 | -.188 | 227 |

\* Mean score is based on a 5-point Likert Scale, 1= Strongly Disagree, 5 = Strongly Agree

#### 4.5. Level of education and Neophobia

In order to test whether there were statistically significant differences amongst diners with varying levels of education in relation to *Setswana* cuisine neophobia, a one-way ANOVA was conducted. The results of the tests are presented in Table 5.

Table 5. Results of analysis of variance (ANOVA) of food neophobia by highest level of education

|                | Mean (Highest Level of Education) |                   |                    |                  |                    | F (3, 203) | Sig. |
|----------------|-----------------------------------|-------------------|--------------------|------------------|--------------------|------------|------|
|                | High School<br>(n=6)              | Diploma<br>(n=94) | Bachelor<br>(n=78) | Master<br>(n=24) | Doctorate<br>(n=6) |            |      |
| Food Neophobia | 2.00                              | 3.38              | 3.15               | 2.88             | 2.50               | 5.40       | .000 |

\* Mean score is based on a 5-point Likert Scale, 1= Strongly Disagree, 5 = Strongly Agree

Table 6. Games Howell post hoc tests for food neophobia by age group

| Age (year)<br>(I) | Age (year)<br>(J) | Mean Difference<br>(I - J) | Std. Error | Sig.     | 95% Confidence Interval |             |
|-------------------|-------------------|----------------------------|------------|----------|-------------------------|-------------|
|                   |                   |                            |            |          | Lower Bound             | Upper Bound |
| High School       | Diploma           | -1.383*                    | .090       | .000 (a) | -1.63                   | -1.13       |
|                   | Bachelor          | -1.154*                    | .103       | .000 (b) | -1.44                   | -.87        |
|                   | Master            | -.875*                     | .220       | .005 (c) | -1.52                   | -.23        |
|                   | Doctorate         | -.500                      | .224       | .299     | -1.40                   | .40         |
| Diploma           | High School       | 1.383*                     | .090       | .000     | 1.13                    | 1.63        |
|                   | Bachelor          | .229                       | .137       | .452     | -.15                    | .61         |
|                   | Master            | .508                       | .237       | .229     | -.18                    | 1.19        |
|                   | Doctorate         | .883*                      | .241       | .047     | .01                     | 1.75        |
| Bachelor          | High School       | 1.154*                     | .103       | .000     | .87                     | 1.44        |
|                   | Diploma           | -.229                      | .137       | .452     | -.61                    | .15         |
|                   | Master            | .279                       | .243       | .780     | -.42                    | .98         |
|                   | Doctorate         | .654                       | .246       | .156     | -.22                    | 1.52        |
| Master            | High School       | .875*                      | .220       | .005     | .23                     | 1.52        |
|                   | Diploma           | -.508                      | .237       | .229     | -1.19                   | .18         |
|                   | Bachelor          | -.279                      | .243       | .780     | -.98                    | .42         |
|                   | Doctorate         | .375                       | .313       | .753     | -.58                    | 1.33        |
| Doctorate         | High School       | .500                       | .224       | .299     | -.40                    | 1.40        |
|                   | Diploma           | -.883*                     | .241       | .047 (d) | -1.75                   | -.01        |
|                   | Bachelor          | -.654                      | .246       | .156     | -1.52                   | .22         |
|                   | Master            | -.375                      | .313       | .753     | -1.33                   | .58         |

\* The mean difference is significant at the .05 level.

The results from Table 5, revealed statistically significant differences among the different groups,  $F(4, 203) = 5.40$ ,  $p = .000$ , thus accepting H3. To identify where the differences were, Games Howell post hoc tests were conducted, since homogeneity of equal variances was violated (Levene's test was significant at  $p = .002$ ). Results of the post hoc tests are displayed in Table 6.

The analysis from Table 6 revealed statistically significant differences between diners with a high school education, with diploma holders ( $p = 0.000$ ) (a); bachelor degree holders ( $p = 0.000$ ) (b) and master degree holders ( $p = 0.005$ ) (c). In all these cases, diners with high school education reported lower levels of neophobia to those with a higher qualification. There were also statistically significant differences between diners with a diploma ( $p = 0.047$ ) and doctorate holders ( $p = 0.047$ ) (d). These findings support hypothesis H3.

#### 4.6. Nationality and Neophobia

In order to examine whether there were statistically significant differences amongst the different nationalities in relation to *Setswana* cuisine neophobia, a one-way ANOVA was conducted. The results of the tests are presented in Table 7.

The results from Table 7, reveal statistically significant differences among the groups,  $F(6, 216) = 3.20$ ,  $p = .005$ . To identify the differences Games Howell post hoc tests were conducted, since equal variances were not assumed (Levene's test was significant,  $p = .000$ ). Results of the post hoc tests are displayed in Table 8.

The analysis from Table 8 revealed statistically significant differences in all cases between diners from Sweden and those from Botswana ( $p = .000$ ) (a), from the United States ( $p = .001$ ) (b), from South Africa ( $p = .005$ ) (c), and from Zimbabwe ( $p = .000$ ) (d). Swedish diners reported significantly lower levels of neophobia than diners from the other four countries. As such the Hypothesis H4 was accepted.

Table 7. Results of analysis of variance (ANOVA) of food neophobia by nationality

|                | Mean ( Nationality ) |             |             |             |             |             |              | F (6, 216) | Sig. |
|----------------|----------------------|-------------|-------------|-------------|-------------|-------------|--------------|------------|------|
|                | BW<br>(n=181)        | GB<br>(n=3) | MW<br>(n=3) | SE<br>(n=3) | US<br>(n=9) | ZA<br>(n=8) | ZW<br>(n=16) |            |      |
| Food Neophobia | 3.12                 | 3.00        | 3.00        | 2.00        | 4.00        | 3.06        | 3.16         | 3.204      | .005 |

\*Mean score is based on a 5-point Likert Scale, 1= Strongly Disagree, 5 = Strongly Agree. 2).

\*\*BW=Botswana, GB=United Kingdom, MW=Malawi, SE=Sweden, US=United States, ZA=South Africa, ZW=Zimbabwe.

Table 8. Games Howell post hoc tests for food neophobia by nationality

| (I) Age<br>(Year) | (J) Age<br>(year) | Mean Difference<br>(I – J) | Std. Error | Sig.     | 95% Confidence Interval |             |
|-------------------|-------------------|----------------------------|------------|----------|-------------------------|-------------|
|                   |                   |                            |            |          | Lower Bound             | Upper Bound |
| Botswana          | United States     | -.884                      | .298       | .140     | -1.99                   | .22         |
|                   | United Kingdom    | .116                       | .072       | .674     | -.10                    | .33         |
|                   | Malawi            | .116                       | .072       | .674     | -.10                    | .33         |
|                   | South Africa      | -.884                      | .335       | .233     | -2.18                   | .41         |
|                   | Sweden            | 1.116*                     | .072       | .000 (a) | .90                     | 1.33        |
|                   | Zimbabwe          | .054                       | .185       | 1.000    | -.55                    | .65         |
| United States     | Botswana          | .884                       | .298       | .140     | -.22                    | 1.99        |
|                   | United Kingdom    | 1.000                      | .289       | .079     | -.10                    | 2.10        |
|                   | Malawi            | 1.000                      | .289       | .079     | -.10                    | 2.10        |
|                   | South Africa      | .000                       | .436       | 1.000    | -1.48                   | 1.48        |
|                   | Sweden            | 2.000*                     | .289       | .001 (b) | .90                     | 3.10        |
|                   | Zimbabwe          | .938                       | .335       | .146     | -.21                    | 2.09        |
| United Kingdom    | Botswana          | -.116                      | .072       | .674     | -.33                    | .10         |
|                   | United States     | -1.000                     | .289       | .079     | -2.10                   | .10         |
|                   | Malawi            | .000                       | .000       | .        | .00                     | .00         |
|                   | South Africa      | -1.000                     | .327       | .148     | -2.30                   | .30         |
|                   | Sweden            | 1.000                      | .000       | .        | 1.00                    | 1.00        |
|                   | Zimbabwe          | -.063                      | .170       | 1.000    | -.64                    | .51         |
| Malawi            | Botswana          | -.116                      | .072       | .674     | -.33                    | .10         |
|                   | United States     | -1.000                     | .289       | .079     | -2.10                   | .10         |
|                   | United Kingdom    | .000                       | .000       | .        | .00                     | .00         |
|                   | South Africa      | -1.000                     | .327       | .148     | -2.30                   | .30         |
|                   | Sweden            | 1.000                      | .000       | .        | 1.00                    | 1.00        |
|                   | Zimbabwe          | -.063                      | .170       | 1.000    | -.64                    | .51         |
| South Africa      | Botswana          | .884                       | .335       | .233     | -.41                    | 2.18        |
|                   | United States     | .000                       | .436       | 1.000    | -1.48                   | 1.48        |
|                   | United Kingdom    | 1.000                      | .327       | .148     | -.30                    | 2.30        |
|                   | Malawi            | 1.000                      | .327       | .148     | -.30                    | 2.30        |
|                   | Sweden            | 2.000*                     | .327       | .005 (c) | .70                     | 3.30        |
|                   | Zimbabwe          | .938                       | .369       | .233     | -.38                    | 2.25        |
| Sweden            | Botswana          | -1.116*                    | .072       | .000     | -1.33                   | -.90        |
|                   | United States     | -2.000*                    | .289       | .001     | -3.10                   | -.90        |
|                   | United Kingdom    | -1.000                     | .000       | .        | -1.00                   | -1.00       |
|                   | Malawi            | -1.000                     | .000       | .        | -1.00                   | -1.00       |
|                   | South Africa      | -2.000*                    | .327       | .005     | -3.30                   | -.70        |
|                   | Zimbabwe          | -1.063*                    | .170       | .000 (d) | -1.64                   | -.49        |
| Zimbabwe          | Botswana          | -.054                      | .185       | 1.000    | -.65                    | .55         |
|                   | United States     | -.938                      | .335       | .146     | -2.09                   | .21         |
|                   | United Kingdom    | .063                       | .170       | 1.000    | -.51                    | .64         |
|                   | Malawi            | .063                       | .170       | 1.000    | -.51                    | .64         |
|                   | South Africa      | -.938                      | .369       | .233     | -2.25                   | .38         |
|                   | Sweden            | 1.063*                     | .170       | .000     | .49                     | 1.64        |

\* The mean difference is significant at the .05 level.



## 5. Discussion

This paper explored the influence of the demographic variables of age, gender, level of education and nationality on local *Setswana* cuisine neophobia among diners in Gaborone, Botswana. Independent samples *t* tests and ANOVA were used for hypothesis testing. ANOVA revealed statistically significant differences among the age groups,  $F(3, 225) = 2.95, p = .03$ . Diners above 50 years reported higher levels of neophobia than the other age groups. This finding is supported in the extant literature as neophobia usually increases with age (Tuorila et al., 2001; Verbeke & Lopez, 2005). It was established by Verbeke and Lopez (2005) that older customers have a higher tendency of restricting their food choice to familiar food than younger respondents. The same was observed in this study. However, the opposite could have been observed, as those aged 50 and above, would be more familiar to traditional *Setswana* cuisine than the other younger age groups, considering that the group of diners was predominantly Batswana (Botswana nationals) (refer to Table 1). Therefore, in terms of neophobia to other cuisines, Verbeke and Lopez's (2005) observation could be suited to the elderly, in contexts where they are visiting non-mundane environments and are encountering cuisine which is outside their familiarity sphere. This is a point for further discussion; why does food neophobia increase with age, even with familiar cuisine, as in this case? One explanation can be advanced from Moulin (2000), who attests to the importance of a strong gastronomic tradition in elevating local inhabitants' appreciation of their traditional food. Kapner (1998) also argued that local people often consider their local cuisine as not worthy of tourist attention. It is only recently that local cuisine has been gaining recognition in tourism (Henderson, 2012; Ott, 2019). In the case of Botswana, this paper, therefore, suggests that a strong gastronomic tradition linked to the appreciation of traditional food by its citizens could be lacking.

Using independent samples *t* tests, this paper also found that though male diners were more neophobic than female diners, these results were not significantly different,  $t(227) = -.188, p > .05$ . The results comply with similar studies that found no significant difference between the genders. Using ANOVA, the study also established that diners who reported their highest level of education as a high school certificate, indicated lower levels of neophobia to those with higher qualifications,  $F(4, 203) = 5.40, p = .000$ , contradicting Tuorila et al. (2001) for instance, who reported lower levels of neophobia in respondents

with higher levels of education. The results also dispute Iflazoğlu and Birdir (2020)'s claim that the lack of information and knowledge about the benefits and importance of new foods often leads to neophobic tendencies in the recipient. The finding raises important controversial questions: Can access to knowledge or education about certain foods, actually lead to their dislike by consumers; assuming that consumers are aware of the knowledge associated with the preparation, the hygiene and the safety aspects? If so, is access to such knowledge in a way, detrimental to the consumption and promotion of local cuisine; some of which rely on unfathomable habits? Such an observation could be true in the case of some traditional *Setswana* cuisine, such as *Serobe*. To prepare this dish, the '*intestines and selected internal parts of a goat, sheep, or cow are first cleaned (although many insist this should not be overdone, or it will remove much of the "flavor"). They are then boiled along with peeled goat or sheep hooves before being finely chopped*' (Denbow & Thebe, 2006:113). In summary, more research is required to ascertain the influence of access to knowledge and information of safety and hygiene practices for specific cuisines and food neophobic tendencies.

The paper also established those Swedish diners reported significantly lower levels of neophobia than the diners from the other nationalities,  $F(6, 216) = 3.20, p = .005$ . The Swedish present a ready market for cuisine tourism in Botswana than the other nationalities; though they constituted a negligible percentage of the sample (1.3%) (Table 1). Neophobia of *Setswana* cuisine was highest among Americans and South Africans who formed part of the survey. In terms of the American market, this finding contradicts a previous report by Pizam and Sussman (1995), where Americans were found to prefer local food at tourist destinations. However, considering that 30% of the American leisure market are typical culinary travellers (Arizona Office of Tourism, 2013), local tourism marketing offices in Botswana could increase their promotion efforts to capture such a market. High neophobic tendency of South Africans could be attributed to shared cultural contexts, such as heritage and practices, that are similar to those of Botswana. Historically, Botswana shares a highly similar cultural background with South Africa and other African countries (Mwakikagile, 2010; English, 2022). Qualitative studies to further probe why other Africans, like South Africans, Malawians and Zimbabweans, and the Americans, present high neophobic tendencies to *Setswana* cuisine, could be pursued in future.



## 6. Conclusion

Although this paper has established, through empirical findings, the importance of demographics on understanding food neophobia associated with *Setswana* cuisine, it could benefit from qualitative follow-up studies that reveal answers to some of the following questions:

1. Why do local tourists (especially Batswana, as in this study) report high levels of neophobia regarding *Setswana* cuisine?
2. Why do elderly diners (especially Batswana) present high neophobic tendencies to *Setswana* cuisine?
3. Why do diners with lower levels of education depict lower levels of *Setswana* cuisine neophobia?
4. Why do South Africans and visitors from Zimbabwe or Malawi present high neophobic tendencies to *Setswana* cuisine?

Findings from this paper also indicate to some extent that diners may not necessarily be compelled to taste local cuisine based on familiarity. This implies that the concept of familiarity and its influence on the consumption of 'own' or indigenous local cuisine is an issue that still needs to be understood.

## Declaration of Competing Interest

The author declares that they have no financial or non-financial competing interests.

## Author Contributions

D. M. Chatibura (ORCID: 0000-0001-5839-7678): Investigation, Methodology, Data Collection & Evaluation, Writing.

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# A Comprehensive Review on Beyşehir Tarhana, A Turkish Traditional Food

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## Abstract

Tarhana, hold an important place in Turkish culture, has a gastronomic value that stands out in different geographies, especially in Turkey, with its diversity. Although many comprehensive studies exist in the literature regarding the types of tarhana, very limited literature information is available on Beyşehir tarhana, which has many unique features and is mentioned in some historical events. The present study aims to create the necessary background in scientifically defining Beyşehir tarhana in a better way and enabling it to be the subject of various research. In the frame of this aim, a comprehensive literature search was performed on Beyşehir tarhana and the information was compiled using a systematic method. In the study, firstly Beyşehir tarhana was examined in comparison with other tarhana types, and its characteristic features were discussed in a conceptual framework. Second, the production steps of Beyşehir tarhana, which has a unique and simple making process with the use of yogurt, yarma wheat and salt, was explained in detail, and consumption habits in the region were revealed. And lastly, the nutritional values of Beyşehir tarhana were evaluated based on the quantitative data present in the literature. Beyşehir tarhana has a remarkable feature to be able to be considered as the ancestor of other tarhanas due to the ingredients used in its production and its name being referred in some historical events. In conclusion, it can be stated that multidimensional and more comprehensive quantitative and qualitative scientific studies should be conducted on Beyşehir tarhana.

**Keywords:** Beyşehir Tarhana, Gastronomy, Snack, Tarhana, Traditional food.

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## 1. Introduction

Human beings have concentrated on consuming the most appropriate foods for themselves with the influence of age, geography and culture in which they are in, and have identified such foods with their own identity over time. Although some of these foods have been forgotten in the course of time, many have managed to reach the present day. These “traditional foods” reaching the present day are important in terms of containing many clues regarding the identity, habits and lifestyles of that society. As a matter of fact, the Turks, coming out of Central Asia and spread to different continents of the world, have succeeded in conveying many traditional products to the present day by enriching their traditional culture and foods with various cultures they migrated and settled, one of those is the tarhana culture.

Tarhana is considered to be one of the most important traditional foods in Turkey. However, it is

seen that there are also many products similar to tarhana in various countries (İbişoğlu & İbişoğlu, 1999; Coşkun, 2003). The standard published by the Turkish Standards Institute in 2004 defines tarhana, which has many different types, as a highly nutritious food product obtained by mixing and kneading wheat flour/yarma, semolina or their mixture with yogurt, pepper, tomato, onion, salt, and various flavoring plant products, drying, grinding and sifting after fermentation (TSE, 2004; Köten et al., 2019). Tarhana is a food considerably rich in protein, carbohydrates, minerals and vitamins (Erbaş et al., 2005; Çekal & Aslan, 2017). With its rich nutritional value, tarhana has diversified under the influence of local cultures, has acknowledged its unique flavor in each region and has become to be called local names.

Tarhana, of which about twenty types are available in Turkey, not only differs in its production methods, ingredients and physical properties, but also has different consumption patterns (Coşkun, 2003).

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Among the most important reasons why tarhana, which reflects the rich culture of Turkish cuisine, has been conveyed as an important cultural value through centuries, can be associated with its long shelf life, practical use and nutritious characteristic, that is, based on a real benefit. Tarhana is a product usually consumed as soup. In addition to the place and diversity of soups in Turkish culture, the high variety of tarhana has made tarhana soup a significant gastronomic value.

Although Tarhanas are mostly consumed as soup, they are also commonly eaten as a snack in some regions of Turkey. However, despite not being common, some tarhana types produced with the addition of molasses or grape must are consumed as a dessert (Yönel et al., 2018; Coşkun, 2003; Çekal & Aslan, 2017; Sormaz et al., 2019). Tarhanas can be classified as ground and unground ones based on their physical properties. Ground tarhanas that are subjected to a grinding process after being produced and dried are mostly used to make soup. Examples of ground tarhanas include Göce tarhana, Flour tarhana, Gediz tarhana, Mixed tarhana and semolina tarhana. Nevertheless, many different tarhana types with their own unique physical properties are available, those of which are not subjected to grinding. The ones eaten as a snack are usually thin with a round shape. These tarhanas can also be consumed as soup by boiling with water if desired. Tarhanas consumed as a dessert are either round or rectangular in shape and not appropriate to be consumed as a soup due to their composition and taste. Beyşehir tarhana, Tokat tarhana and Maraş tarhana can be given as examples of unground tarhana types.

Although there are many different tarhana types produced in Turkey and numerous studies have been conducted on certain tarhana types, the knowledge on Beyşehir tarhana is limited and repetitive in nature in the literature. The aim of this study, by comparatively evaluating the characteristics, ingredients and processes of Beyşehir tarhana, an important tarhana type in terms of cultural features and nutritional values, is to help better understanding of tarhana, which is a significant element of Turkish gastronomic culture, and to contribute to the literature. In the preparation of the present review study, all relevant sources, scientific or non-scientific, published until December 2021 were searched with a comprehensive strategy and sorted out according to a systematic method. This review paper is an attempt to reveal an extensive and objective evaluation of Beyşehir tarhana based on literature search and personal experiences.

## 2. Beyşehir Tarhana and conceptual framework

Tarhana is a fermented product based on cereal and yogurt (Atar, 2019). There are about twenty types of tarhana shaped according to the taste and gastronomic culture of different regions in Turkey, and the most well-known of which are Maraş tarhana, Aegean tarhana, Göce tarhana, Grape tarhana, Gummy tarhana and Beyşehir tarhana (Coşkun, 2003).

Beyşehir, a district of Konya Province (Turkey), is located right on the shore of Lake Beyşehir, the third largest lake in Turkey (Population: 71,370 people; altitude: 1205 m; surface area: 2,121 km<sup>2</sup>). It is a long-established and historical city that accommodates historical sites dating back to the 8000s BC and belonging to the Neolithic Age, which has been the capital of the Eşrefoğulları Principality. In addition, it is home to works belonging to the Hittites built in the 2000s BC and many other historical and touristic elements. Some of these historical sites are listed on the UNESCO World Heritage Tentative List. Beyşehir tarhana, a type of tarhana that is still intensively produced in Beyşehir city of Konya and many small towns and villages around it, takes its name from the city's name. It is expressed as "Tarna" in the local dialect (The Ministry of Culture and Tourism of Republic of Turkey, 2022).

Beyşehir tarhana (Figure 1), which has its own unique production process and even differs from the tarhana definition made by Turkish Standards Institute (TSE, 2004) with certain features, is the plain type containing only yarma wheat (also called dövme wheat), yogurt and salt in its composition. Again, unlike other tarhana types, Beyşehir tarhana is produced without a fermentation process and grinding-sifting steps. Beyşehir tarhana, which is also used to make soup, is mostly consumed as a snack culturally. When Beyşehir tarhana is characterized in the scope of its physical properties, it is seen that it has a round shape with a ~15 cm diameter and ~2 mm thickness and weighs about ~30 g, depending on the production process and manufacturers' preferences. The fact that many types of tarhana are available in Turkey and their different properties are used interchangeably makes new subtypes of tarhana emerge. Beyşehir tarhana also takes its share of this cultural diversity. Although pepper, poppy seeds, tomato, onion, and aromatic herbs are not used in the traditional production of Beyşehir tarhana, it was determined that it can also be produced in many different types in the Beyşehir region in recent years.



Figure 1. Appearance of Beyşehir Tarhana (Photographed by Mehmet Başlar)

For example, in addition to the novel Beyşehir tarhanas produced using different ingredients such as tomato paste, hot pepper and thyme, it is also seen that tarhanas with the thickness of chips, as in Maraş tarhana, are manufactured.

As can be consumed plain, Beyşehir tarhana can also be eaten in different forms after being baked in oven, on a wood fire or fried in deep oil (Figure 1-b, c, d). Its most common consumption culture involves baking it before consumption.

The tarhanas have been cooked in a wood fire for a long time, but a company first started to produce industrially and distribute them nationwide in 2021. Depending on the cultural changes that have occurred recently, frying tarhana with a microwave or toaster can also be considered among the cultural innovations. The consumption rituals of Beyşehir tarhana shows that it is traditionally consumed along with walnut, and sometimes with peanut. Nevertheless, it is found to have been recently started to be consumed together with ketchup and mayonnaise in places. Although frying Beyşehir tarhana, which is consumed as a snack, with various techniques makes it more delicious; the health risks of the new compounds to be formed during frying process have yet to be comprehensively evaluated.

### 3. Production of Beyşehir Tarhana

#### 3.1. Ingredients

The main ingredients of the traditional Beyşehir tarhana are ayran, yarma wheat and salt. Nevertheless, it is common that some black cumin and/or butter can be optionally added to the formulation.

#### **Tuluk yogurt (A type of drained yogurt):**

yogurt, the main component of tarhana (“Tuluk yogurt” is traditionally used), is a type of strained yogurt that is matured by being kept in tuluks made of local cloth for months. It has salty, solid and aromatic properties and contains low water content. In traditional production, yogurt is made with plenty of milk obtained from livestock, and then this yogurt is processed into Tuluk yogurt. This procedure, which includes maturing of the product for months with a special process specific to Tuluk yogurt, is a method used to preserve milk and transform it into new products. While some of the obtained Tuluk yogurt is used as kurut (locally called katık) and widely consumed at breakfast, some of it is converted into ayran and utilized in the production of yogurt butter. Tarhana production, which was traditionally a by-product utilization method for fat-free ayran, has changed its dimension with the fact that commercial butter production become widespread today. Tarhana production is no longer a by-product utilization method in the present day and tarhana has become a product made by almost everyone in Beyşehir city and all surrounding towns. It is seen that Beyşehir tarhana is produced with full-fat ayran today; even it has become a product in which butter is added. Beyşehir tarhana, which has been traditionally produced for years, is recently started to be industrially produced, and sold in various platforms. Since the production of Tuluk yogurt is a very long and laborious process, normal strained yogurt is widely used in tarhana production today. The first condition to obtain a high-quality tarhana starts with procuring a full-fat and delicious strained yogurt. After making strained yogurt ready, it is processed into ayran when tarhana production is begun.

**Yarma wheat:** Yarma wheat used in making tarhana is obtained by partially breaking the medium-hard wheat that has not been subjected to any heat treatment and reducing its size. The processes to obtain yarma wheat and bulgur wheat (cracked wheat) are similar, the only difference however is that wheat is subjected to heat treatment in bulgur wheat production, whereas it is only dried without cooking after being sorted and washed in yarma wheat production. Since tarhana is not desired to be dark in



color, it is preferred to produce yarma wheat from light-colored wheat as much as possible.

**Salt:** Salt is used in tarhana production both to give flavor to tarhana and to contribute to its long shelf life. Considering that some tarhana varieties in Turkey are sweet because they are made with the addition of molasses, the salt in Beyşehir tarhana provides a characteristic attribute to the product.

### 3.2. Production Process

The most commonly used formulation in the production of traditional Beyşehir tarhana contains 16 kg yarma wheat, 20 kg strained yogurt and a sufficient amount of salt (approximately 350 grams). In addition to this, it is also likely to come across numerous different formulations. For 16 kg of yarma wheat, the maximum and minimum amounts of strained yogurt are calculated as 20 kg and 10 kg, respectively. In case of using less amount of yogurt, some butter can be added into the formulation. Excessive use of strained yogurt in tarhana production is a factor which accelerates the deterioration process of tarhana, whereas an insufficient amount of yogurt in the formulation causes the product to be bland adversely affecting its eating quality. The optional use of black cumin in the traditional production of tarhana is a common practice. The production steps of Beyşehir tarhana are illustrated in Figure 2.

**Ayran Production:** Ayran used in the traditional tarhana is produced from a strained yogurt (Tuluk yogurt) specific to Beyşehir vicinity. Ayran is desired to have a medium consistency and the ones with high water content is not preferred. On the other hand, ayran with high consistency is not also preferred since it makes tarhana production in a boiler difficult. Milk fat, the main component of butter, is rather important in terms of taste and flavor of tarhana, and tarhana produced from full-fat ayran is of higher quality. It is even seen that in some regions, butter is added to the tarhana dough for higher quality tarhana production. Tarhanas obtained from non-fat ayran are usually hard and bland. Since ayran is a product that deteriorates faster than strained yogurt, it is obtained immediately before beginning tarhana production.

**Cooking:** Beyşehir tarhana is traditionally cooked on the wood fire. Special “tarhana boilers” as well as “tarhana paddles”, which ensure that these boilers are sufficiently stirred, should be available in the production of tarhana. It is necessary to roughly adjust the saltiness of ayran placed in the boiler before cooking. Some amount of black cumin can be optionally added in this step. When ayran starts to be

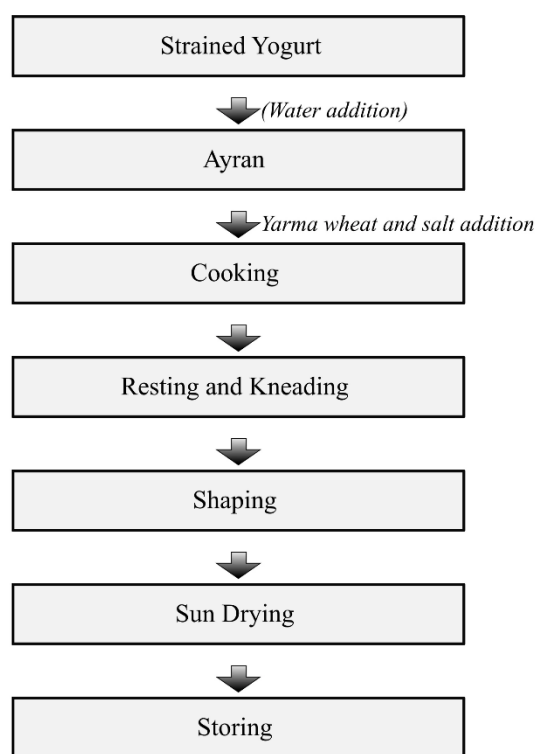


Figure 2. Production steps of Beyşehir Tarhana

heated on light-wood fire, some yarma wheat is added immediately. After ayran becomes lukewarm and evaporation starts from the surface, the remaining part of yarma wheat is added slowly. Since ayran, a fermented product, has high acidity, it is quite important to add yarma wheat and stir it on low heat before the milk proteins are denatured and precipitated. It is important to stir the tarhana throughout the cooking process, but stirring is especially important in the final stages of cooking (Figure 3). In addition, the heating of the dough and the addition of yarma wheat make the stirring process more difficult but just as important. After making sure that all parts of the tarhana dough are boiling, it is removed from the fire and left to cool.

**Resting and Kneading:** The cooked tarhana dough is first left to cool. It is important that tarhana, which is traditionally boiled in the afternoon (about 5 pm), is rested about 12 hours until the first light of the morning (about 5 am). However, in some regions, the resting period can be limited to only a few hours. The resting process plays an important role in thorough maturation of the components intermixed with each other as a result of boiling. After resting and cooling, the tarhana dough is well kneaded. In this step, if needed, ayran can be added to adjust the consistency or salt can be added to adjust the saltiness of the product. After kneading,





Figure 3. Beyşehir tarhana traditionally cooks on the wood fire (Photographed by Adem Murat Başlar from İmrenler Village in the Beyşehir Region)

the tarhana dough is made into large (25-30 cm diameter) tarhana dough balls.

**Shaping:** After the resting step, the weight adjustment is done. For this purpose, for each tarhana, small balls of tarhana dough are prepared. If the size of tarhana is desired to be large, the weight is slightly increased, if it is desired to be small, the weight is decreased. Small balls of tarhana dough whose weight is adjusted become ready to be given shape. Traditionally, tarhanas are gradually given a round shape with great care and effort, with the skill of partly wetted hands, however, this shaping method is no longer practised today. Small balls of tarhana dough in the present day are easily shaped with the help of simple tarhana shaping tools that have been in use for the last 10 years. These “tarhana shaping tools” consist of two moving plates attached to each other by a hinge.

In order to prevent tarhanas from sticking to plates, the dough ball is placed between two plastic bags and compressed with plates to obtain the round shape of Beyşehir tarhana (Figure 1a). However, although it has begun to be forgotten today, Beyşehir tarhana produced only for soup making in the past is known to be made by a method that is similar to that of Göce tarhana.

**Sun Drying:** Beyşehir tarhana is traditionally sun-dried. For this purpose, a special flooring for drying called “Tarhanalık Çığ” is used, which is obtained by stringing reeds (sometimes sunflower stalks) side by side. With the use of this drying method, tarhana is laid on the streets or large balconies of Beyşehir villages and towns in the summer, which adds a characteristic atmosphere to the region (Figure 4). The sun-drying process takes approximately 2-3 days.

**Storing:** Though the climate in Beyşehir vicinity is sufficiently dry and cold, Beyşehir tarhana, which is transported to humid regions, should be stored airtightly. Beyşehir tarhana, which is a dry product, can be stored for a couple of years in a dry and cool environment. In the region, tarhanas produced in the previous year are dried under the sun for a day and stored again. Tamer et al. (2007) reported that tarhanas possess a shelf-life of 2-3 years without deterioration due to the fact that they usually have low pH value (3.8-4.4) and low moisture content (6-9%) and are poor in terms of spoilage microorganisms (Salama, 1992). Although Beyşehir tarhana can be stored for a long time for similar reasons, it has been stated that the product starts to deteriorate by uptaking moisture within a year in regions with high humidity.

#### 4. Nutritional Value of Beyşehir Tarhana

Tarhana is appetizing, regulating intestinal flora, facilitating digestion and highly delicious food, as well as a food product that stands out with its high nutritional value (Coşkun, 2003). Nevertheless, the composition of tarhana differs to a very considerable extent depending on the type and production process. Thus, to be able to speak of the nutritional value of tarhanas, their composition and the production method should be taken into account.

Beyşehir tarhana includes two main ingredients: yarma wheat and yogurt. While different ingredients other than cereal and yogurt are used in the production of other tarhana types, there are no other ingredients but yarma wheat and yogurt (except for salt) in Beyşehir tarhana. However, it can be said that Beyşehir



Figure 4. Sun drying (Photographed by Havva Başpınar from İmrenler Village in the Beyşehir Region)

tarhana is more nutritious compared to other tarhana types, thanks to its high yogurt content. It is accepted that combining cereals with milk-based foods, as in tarhana, creates a nutritionally beneficial diet (Tamer et al., 2007). Because each food group has some significant advantages and disadvantages. Combining different food groups in this way is of a special importance in terms proportionally reducing the risky compounds (starch, cholesterol, etc.) for human health present in foods and providing diversity in nutritional value (vitamin, fatty acid or amino acid profile, etc.). In other words, the protein quality of cereals, which are plant-based, is usually low, whereas yogurt with an animal origin has a higher-quality protein content. When tarhana is evaluated in terms of protein quality, it can be stated that including yogurt and cereal together in the formulation enriches the amino acid profile of tarhana compared to cereals, ensuring that it has a relatively broader amino acid profile. Likewise, Beyşehir tarhana is anticipated to have a richer fatty acid profile due to the different origins of ingredients.

When the composition of tarhanas is evaluated in general terms, it can be stated that they are rich in vitamins and minerals (Erbaş et al., 2005; Çekal and Aslan, 2017). Tarhana, which is rich in the content and variety of vitamins, contains many different vitamins such as A, B1, B2, B6, C, D, E and K. Similarly, tarhana can have a rich variety of minerals including copper, zinc, iron, calcium, magnesium, manganese, potassium

and sodium (Yönel et al., 2018; Dağlıoğlu, 2000; Özdemir et al., 2007). In some tarhana types, the use of various spices and vegetables comes to the fore, while in others, the use of grain varieties comes to the fore. The variety of ingredients used in its production greatly influences the mineral and vitamin profile of tarhana. Therefore, while mentioning the vitamin and mineral contents of tarhana, a traditional fermented food product, it is necessary to take into consideration that the composition is a quite significant factor.

Yoghurt, in addition to playing an important role in terms of strengthening the immune system and bones with its rich content of B vitamins and calcium, is also a significant food source for human health with its high-quality amino acid and fatty acid profile. Yarma wheat, on the other hand, contributes to human nutrition with its high content of dietary fiber, vitamin A and B group vitamins and amino acids (Coşkun, 2003; Yörükoğlu & Dayısoylu, 2016; Slavın et al., 2009; Altundağ et al., 2020). Beyşehir Tarhana, which contains yoghurt and yarma wheat as the main ingredients, is an important and healthy snack that makes positive contributions to human health with its high nutritional value.

Being a cereal and milk-based product, tarhana is at the same time a food with a low glycemic index (Yıldırım & Güzeller, 2016). Due to the fact that the production of yarma wheat does not involve any



significant food processes that will change the nutritional value of wheat, it provides an important fiber support to tarhana. Dietary fibers tarhana contains is anticipated to help keeping the blood cholesterol level balanced and reducing the risk of colon cancer (Erbaş, 2003; Özçelik & Özdoğan, 2007).

Many tarhana types, which are generally subjected to fermentation process, are regarded as a beneficial food for health, by means of bacterial flora originating from yogurt and numerous phytochemicals that are formed during the fermentation process (Özçelik ve Özdoğan, 2007; Coşkun, 2003). In addition to this, some claims exist in the literature that tarhanas are probiotic foods, however, there are question marks about ensuring the conditions required for probiotic microorganisms and preserving them until they reach the consumer. On the other hand, it is not possible to say that Beyşehir tarhana is a probiotic product. Because while many types of tarhana are subjected to fermentation during production process, Beyşehir tarhana is not additionally fermented after the ingredients are intermixed. In this sense, due to this reason, it is poorer than other tarhana types in terms of bioactive compounds provided by fermentation. Besides, an application of heat treatment at high temperatures is performed during the production of Beyşehir tarhana. This heat treatment kills spoilage microorganisms, meanwhile it will also cause the bacteria originating from yogurt to be substantially inactivated. Even though the production process of Beyşehir tarhana lacks fermentation, fermentation products originating from yogurt increase the nutritional value of Beyşehir tarhana and present a positive contribution to human nutrition.

A study conducted by Atar (2019) reveals the nutritional value and composition of Beyşehir tarhana (Table 1). As seen from the table, the energy value of Beyşehir tarhana has been determined as 423.13 kcal/100g. As a matter of fact, when compared to Sivas tarhana having an energy value of 365 kcal/100g (Gürdaş 2002), it is seen that Beyşehir tarhana has higher energy content. This high energy value of tarhana can be explained by its high carbohydrate content and the fact that it is a dry food. Its notably high energy-giving nature of Beyşehir tarhana allows it to be used as an easy and delicious food source in difficult conditions such as mountaineering, nature sports, war conditions and long journeys. In relation to that, in a story narrated about the period of Yavuz Sultan Selim, Beyşehir tarhana has been stated to be used in harsh desert conditions due to its durable and nutritious aspects (Milliyet, 2017; Doymuş, 2022).

Table 1. Nutritional value of Beyşehir tarhana

| <i>Nutritional Characteristic</i> | <i>Value</i> |
|-----------------------------------|--------------|
| Moisture content (%)              | 7.94         |
| Carbohydrate (%)                  | 61.90        |
| Protein (%)                       | 16.91        |
| Fat (%)                           | 1.98         |
| Mineral matter (%)                | 2.75         |
| Salt (%)                          | 1.65         |
| pH value                          | 4.94         |
| Acidity (%)                       | 16.43        |
| Energy (kcal/100g)                | 423.13       |

\*The table was prepared using the data presented in the study by Atar (2019).

Since cereals have a high starch content, tarhana, one of the main ingredients of which is cereal, is a product rich in carbohydrates. Milk fat present in yogurt used in tarhana making relatively increases the quality fat content of tarhana and enriches the low fat content of the cereal. Accordingly, tarhana with high starch and fat content has also a quite rich profile in terms of energy content.

The mean nutritional contents of 134 tarhana samples collected from different regions of Turkey have been determined (Siyamoğlu, 1961), and the dry matter content of 10.2%, the protein content of 16%, the carbohydrate content of 60.9%, the fat content of 5.4%, the salt content of 3.8% and the ash content of 6.2% have been reported (Coşkun, 2003). The comparison of the nutritional value of Beyşehir tarhana presented in Table 1 with the average nutritional values of tarhanas produced in Turkey, it is seen that Beyşehir tarhana has high energy and fat contents, similar carbohydrate and protein contents and lower salt and mineral content. The fact that Beyşehir tarhana has a high yogurt content (even the addition of butter is sometimes seen) is assessed to cause Beyşehir tarhana to contain high fat content and accordingly high energy value.

The application of high temperatures in the processing of foods (roasting, baking or deep-fat frying) can lead to the formation of certain toxic compounds. Such heat treatments applied to foods with high carbohydrate content such as cereal, in particular, can result in the development of color, taste and flavor through a series of chemical pathways named Maillard reactions (Yıldız et al., 2010; Tyl & Crump, 2003; Karagöz, 2009).

In the region, Beyşehir tarhana is widely consumed by frying (in the oven, in deep-fat or on an ember). These delicious consumption patterns of tarhana may also bring some health risks due to compounds formed during frying of the product. As can be discerned in Figure 1, a level of browning that can be noticed by eye occurs in tarhana during the heat treatment. The most

important reason for this browning is considered to be the non-enzymatic Maillard reaction that causes color and flavor formation in foods. As it is known, there may be losses in some important compounds (amino acids, fatty acids, etc.) after the Maillard reaction, as well as it is likely that certain compounds are formed, especially acrylamide and HMF. It has been shown in the literature that exposure to these compounds at a high level adversely affects human health, thus detailed assessment and reporting of the health risks in fried tarhanas is a significant issue for the public health of local people in the region.

## 5. Conclusion

Tarhana, which is known by almost everyone in Turkey and has important gastronomical value, is commonly consumed as soup. In spite of differing from each other in terms of composition and production processes, different tarhana types have many characteristics in common. Although there is limited information in the literature regarding when and where tarhanas has been first manufactured, Beyşehir tarhana attracts attention with the fact that its name has been referred in some historical events and its plain composition. Some types of tarhanas in Turkey have come a long way in the industrialization process, however, the industrialization of Beyşehir tarhana has just started recently. In this respect, it is of importance to determine drying processes of Beyşehir tarhana and investigate alternative drying methods. The consumption of Beyşehir tarhana is expected to ever increase with industrialization. Tarhana is a healthy snack; however despite the fact that fried ones are more delicious, frying them with various methods is likely to bring certain health risks, hence the comprehensive investigation of new compounds forming in the frying process is of great significance.

## Declaration of Competing Interest

The authors declare that they have no financial or non-financial competing interests.

## Author Contributions

M. Başlar (ORCID: 0000-0002-8369-0769): Definition, Conceptualization, Methodology, Writing, Editing, Supervision.  
G. N. Özçelik (ORCID: 0000-0002-1135-2365): Investigation, Data Collection, Data Analysis, Writing.  
H. Çalışkan (ORCID: 0000-0002-6861-8021): Investigation, Data Collection, Data Analysis, Writing.

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