

# TARHANA

## *A Very Old Traditional Fermented Cereal Turkish Food*

[ Abdullah Badem ]

**Abstract—** It is known that the emergence of the Turkish Nation on the history scene dates back to Central Asia and migrated from there to Anatolia. Turkish cuisine has been in interaction with many nations in Asia and Anatolia throughout the history. A wide variety of dishes are made with the wealth that comes from here, mostly cereals, vegetables, naturally grown plants, broths, pastries, olive oil and soups are used. The nomadic life of Turks since Central Asia has been effective in the emergence of foods such as dried meat, roast meat, pastrami, kurut, tarhana, dried fruit (kak) and vegetables etc. By drying the foods, it is provided to be more durable and portable. Tarhana is a very old food of Turks and tarhana soup is also made. Tarhana is a type of food made by fermenting and drying the yogurt, flour, sometimes wheat and some vegetable-herb-spice mixture. In this study, it is aimed to give information about the history, types, composition, making, production and nutritional properties of tarhana.

**Keywords—** tarhana, fermented food, turkish cuisine, history, nutritive

### I. Introduction

The Turkish Nation (also Turkish cuisine) was born from Central Asia and reached today. Anatolia is a place located at the intersection of Europe, Asia, Egypt, Africa and Mesopotamia. During the migration of Turks from Central Asia to Anatolia and because Anatolia is a transit place, it has been interacting with many nations and Turkish cuisine has a rich culinary culture [1]. In this way, the Turkish nation has created a unique culinary culture with its food variety, cooking techniques, table arrangements, service methods and winter foods, and it is considered among the three leading cuisines of the world [2, 3, 4]. Anatolia has hosted many communities and states such as Hatti, Persians, Hittites, Urartians, Phrygians, Romans, Lydians and Byzantines. Turkish cuisine has been influenced by many different cultures such as Persian, Hittite, Byzantine, China, Arabs, Celts and Romans [1, 5].

One of the general features of Turkish cuisine is that it has soup at its table. It is known that the tarhana, which the Turks brought with them from Central Asia, introduced them to the Middle East, Anatolia, Hungary and Finland, and the tarhana has been consumed since Central Asia. In the periods after the establishment of the Ottoman State (15-16 centuries), it is widely consumed especially in winter [4, 6, 7]. The first Turkish cookbook, Melceü't-Tabbâhin (Cooks' shelter), was published in Istanbul in 1844 and the fact that the author of the

book was written by the medical doctor Mehmet Kamil shows that the relationship between nutrition and health was known in those years. In the first part of this book, the name of tarhana is mentioned among the dishes made by the Turks [8]. It is stated that the cookbooks written after this date refer to this book [9].

Qualitative research uses qualitative data collection methods such as observation, interview and document analysis, and this type of research has been preferred to obtain a general opinion about tarhana [10].

In this article, it is aimed to compile information about the production of tarhana and tarhana soup in terms of science and social aspects by using document analysis, which is one of the qualitative data collection methods.

### II. Tarhana and Tarhana Soup Varieties

First, It is seen that many different dishes have been made by many nations where Turks have interacted in Asia and Anatolia throughout history and the effect of this cultural change has been reflected on Turkish cuisine since the Seljuk and Ottoman periods. In Turkish cuisine, mostly cereals, vegetables, naturally grown plants/weed/herbs, broths, cakes, olive oil and soups are used [2]. With the transition of Turks from the nomadic life to the settled life, with the start of agriculture besides the consumption of animal products, cereals especially wheat, barley, some vegetables and fruits have entered Turkish cuisine, and especially cereals have been used extensively in Turkish dishes. The nomadic life of Turks in Central Asia, the need to move from place to place, has been effective in the development of foods such as dried meat, roast meat, pastrami, kurut, tarhana, kak (dried fruit) and vegetables etc. With the drying process, it has been made possible for the foods to last longer and have less volume [11].

One of the oldest recipes of tarhana in writing is found in "Ali Eşref Dede's food booklet", which was known to be written before 1859. According to this recipe, some bread is mixed with the bag (thick) yogurt and beaten in the muller and left overnight. Then, it is cooked for one - two hours on low heat with meat or chicken broth. Enough bread is cut into small pieces and fried in butter. Toasted bread is added to the prepared soup and consumed [9]. Tarhana, one of the traditionally prepared soups of Turkish cuisine; sour yogurt, flour, sometimes whole wheat, tomato, pepper, onion, mint, dill, parsley and salt mixture is produced by fermenting, drying, crumbling and storing in a cool place for consumption [12, 13, 14]. In Tarhana Standard [15], tarhana is defined as; "made by mixing wheat flour, cracked wheat, semolina or their mixture with yogurt, pepper, salt, onion, tomato and herbal ingredients (giving taste, flavor and fragrance, harmless

to health), kneading, drying after fermenting, grinding and sieving.

While tarhana was previously consumed as a soup, especially at breakfast [16], it is now consumed at lunch and dinner, and is shown as an inspiration for instant soups [3, 7, 14, 17].

Many parts of Turkey, tarhana production is made, method of preparation and materials used may vary from region to region [18]. The main ingredients used in the production of tarhana are flour (wheat flour / cracked wheat, semolina) and yogurt. In addition, pepper (red pepper and / or green pepper), tomato, onion, salt, some flavoring herbs-spices (dill, mint, basil, etc.), as well as milk, soybean, lentil, chickpea, corn flour and egg [5, 6, 12, 14, 17, 19, 20].

According to TS 2282 [15], tarhana is divided into 4 different groups: flour, göce (peeled and crushed wheat), semolina and mixed tarhana. Wheat flour, cracked wheat and semolina used in the production of tarhana is based on the formation of the groups. In Turkey there are 20 different kinds of Tarhana: They made 18 of them being used in soups, 2 of them are consumed for dessert. These tarhanas are known by different names in each region [14]. Tarhana varieties produced in Turkey are given in Table 1. Bolu Kızılıcık Tarhanası (01.12.2017-252), Maraş Tarhanası (23.02.2012-154), Muğla Göce Tarhanası, Uşak Tarhanası (21.03.2017-209) and Çakmak Tarhanası are also listed in geographical indications [21]. Pictures of some tarhana are shown in Table 2. In some countries, products similar to tarhana are produced, for example, kishk made in Egypt, Syria, Lebanon and Jordan, kushuk in Iran and Iraq, trahana in Greece, tahonya in Hungary, and talc in Finland, and atole in Scotland [6, 14, 17, 20].

The recipe for tarhana and tarhana soup, traditionally made in the Konya-Seydişehir region, is given below [16]. The materials traditionally and commercially used for making tarhana and tarhana soup are given in Table 3 and Table 4. Tarhana majority produced in Turkey are produced in conventional but is carried out in part, commercial production. There are two methods of commercial tarhana production, the straight method and the sour dough method [7]. While fermented dough is called wet tarhana, more durable tarhana is obtained by drying [11]. It is stated that the dried tarhana can be stored for 2-3 years [17].

### A. Production of Tarhana

1. The chickpea, soaked one day, is boiled and left to cool.
2. Washed vegetables (onion, pepper paste, green pepper, tomato) are cut and cooked in a saucepan until tender, and left to cool.
3. Add the minced parsley, yogurt, salt, yeast and enough flour to the mixture and prepare a dough in the consistency of the earlobe.
4. The dough is kneaded and covered with a cloth and left to fermentation for 4-5 days at room temperature, but the dough is kneaded again every day.

5. When the dough yeast is completed and sour, it is divided into small pieces and laid on a cloth, occasionally turned upside down and thinned.
6. Dough is cut into smaller pieces and rubbed by hand. It is important at this stage and the dryness should have a moistness that can be rubbed by hand. Otherwise, the dough becomes too dry and does not rub.
7. The rubbed dough is sieved or drawn in a food blender, laid in this way for 2-3 days.
8. The finely dried final mixture has become tarhana and is stored in cloth bags or glass jars and consumed in winter.

TABLE 1. TARHANA TYPES IN TURKEY [6, 14, 22].

Tarhana name / Region	Ingredients	Type of Consumption
1. Aegean (wheat) Tarhana / Aegean Region	Tomato, pepper, onion, yogurt, flavoring herbs and flour	It is prepared in summer and filled in jars and consumed in the form of soup.
2. Göce Tarhanası /Ankara, Maraş, Muğla, Aydın	Cracked wheat, water, salt, thick yogurt / ayran,	It is kept in water for a few hours before cooking. Then cooked consumed.
3. Top (circular) Tarhana / Isparta	Cracked wheat, dill, salt, water, yogurt, mint, parsley	Before cooking, put in warm water from the previous evening. Next day Boiled chickpeas and kidney beans are added and boiled. Then it is consumed with the addition of hot oil and tomato paste.
4. Trakya (Thrace) Tarhanası / Kırklareli, Edirne, Tekirdağ	Yogurt, red pepper, onion, flour, salt, sourdough, tomato, tomato paste, spices, broth, butter, cheese, dill, mint, black pepper, buy herb seeds	It is prepared in summer and filled in jars and consumed in soup. After cooking, melted butter is poured on it.
5. Ak (White) Tarhana / Kütahya	Flour, yeast, yogurt, red pepper, mint, salt, hot pepper, tomato, onion	Butter is melted in a frying pan and minced meat is roasted. It is consumed by pouring it on the prepared soup.
6. Gediz Tarhanası/ Gediz	Red pepper, onion, yogurt, mint, salt, flour, sourdough	It is consumed as soup in winter.
7. Kıymalı (with minced meat) Tarhana / Thrace region	Red pepper, tomato, onion, milk, minced meat, salt, cheese, yogurt, fresh yeast, flour, tarhana	The soaked tarhana is cooked with a mixture of minced meat and tomato paste and is consumed together with pickles in winter.
8. Kızılıcık/Kiren Tarhanası / Bolu, Kastamonu, Bursa, Kütahya, Zonguldak	Cranberry, wheat flour or barley göce (peeled and crushed wheat), salt	It is cooked with onion, garlic, butter and various spices and is consumed as a soup.
9. Beyşehir Tarhanası / Konya	Göce (peeled and crushed wheat), ayran, butter, milk, water	It can be consumed fresh or as a soup. It is also roasted and added in walnuts and consumed in the form of snack.
10. Göçmen (immigrant) Tarhanası / Marmara Area	Wheat flour, yogurt, curd cheese, tomato, tomato paste, green pepper, egg, salt, bread yeast, various spices	Before consumption, water is added to tarhana dough, after melting it is cooked without adding oil. After it becomes a soup, milk and cheese are added and consumed.

TABLE 1. (CONTINUOUS) TARHANA TYPES IN TURKEY [6, 14, 22].

Tarhana name / Region	Ingredients	Type of Consumption
11.Kastamonu (wet) Tarhana / Kastamonu, Eskişehir, Çankırı	Green pepper, onion, dill seed, cucumber, quince, wheat flour, yogurt, tomato, red pepper, parsley, garlic, dill, basil, spices	It is prepared in summer, filled with jars and made soup, and consumed with black pepper.
12.Sivas Tarhanası / Sivas	Tomato, green pepper, red pepper paste, onion, parsley, yogurt, mint, spices (basil, dill, cumin), egg, chickpeas, oil and yeast, apple, pear, quince, carrot	Dry tarhana and chickpeas are soaked one day before. When the soup is cooked, butter-hot mint is poured over it and consumed.
13.Maraş Tarhanası / Maraş	Cracked wheat, yogurt, thyme, nigella, water, salt	There are many forms of consumption such as non-dried, semi-dried, fully dried snacks, as soup, dipping in hot broth, fried in oil or oven, roasting with onion in oil, grilling in barbecue.
14.Şalgamlı (with turnip) Tarhana / Maraş	Maraş tarhanası, boiled chickpeas, turnips	While the Maraş tarhana is being cooked; After the turnips are peeled and chopped, they are boiled and thrown into the soup. It is boiled for a while with the addition of boiled chickpeas. Sauce made of mint, olive oil, chili pepper and garlic is added to the soup.
15.Pancarlı (with beet) Tarhana / İnebolu, Kastamonu	Beet, white tarhana	After the beets are cut and boiled, add tarhana and cook.
16. Süt (milk) Tarhanası / Gelibolu, Çanakkale	Cracked wheat, milk, salt, pepper	It is used in ravioli, wrapping and stuffing or in rice making.
17.Hamur (dough) Tarhanası / Gölhisar	Coarse ground wheat flour, black cumin, mint, chert, quince, red pepper, water, salt	It is consumed with garlic and mint yogurt.
18. Et (meat) Tarhanası / Karaman	Minced meat, thin bulgur, potatoes, spices, tomato paste, salt, water	It is cooked on a hot plate or on the grill and consumed together with ayran.
19.Üzüm (grape) Tarhanası / Tokat	Pekmez (molasses), white or black grape must, thin cracked wheat	It is consumed only as dessert.
20. Tatlı (sweet) Tarhana / Malatya	Grape must, düğür, gendüme veya thin cracked wheat	When fresh, unsalted butter and crushed walnuts are sprinkled and consumed as dessert. The dried pieces are softened with hot water in the winter and boiled again.

TABLE 2. SOME TARHANA PICTURES.



TABLE 3. RECIPE FOR PRODUCTION TRADITIONAL AND COMMERCIAL TARHANA.

Material	Quantity [16], g	Quantity [7], g
Wheat flour	3000	100,0
Wheat semolina	-	37,5
Yogurt	1500	60,0
Chickpea	175	-
Salt	-	5,0
Onion	250	37,5
Red pepper paste	1000	7,5
Green pepper	250	-
Parsley	200	-
Tomato	1500	-
Tomato paste	-	7,5
Yeast	-	20,0
Lentil flour	-	5,0
Sunflower oil	-	1,5
Citric acid	-	1,0

TABLE 4. RECIPE FOR MAKING TRADITIONAL TARHANA SOUP [16].

Material	Quantity (g)
Tarhana	40
Water	1200
Butter	20
Tomato paste	10
Salt	6
Mint	0,75

### B. Making tarhana soup

1. Add 6 cups of tarhana in a pot, soak it in cold water and mix it for 15-20 minutes.
2. In another pot, the fat is melted and the tomato paste is fried.
3. Add the tarhana in the saucepan with the oil roasted tomato paste.
4. Soup is boiled, stirring over medium heat.



5. After boiling, the fire is reduced and cooked until it becomes thick (average 7-8 minutes).
6. While serving the soup, dry mint and pepper are poured on it.

### III. Fermentation in Tarhana

With the fermentation, which is the most important stage of the production of tarhana, the physical properties, nutritional value and food consumption of the foods used in its production are improved and a food with a long shelf life is produced. In Tarhana production, alcohol and lactic acid fermentation takes place using yoghurt, chickpeas and sour milk etc., and a unique product with its unique odor and taste is produced at the end of the period. When the desired sourness or taste and smell is achieved, the fermentation period is completed [26, 27]. Tarhana dough contains *Lactobacillus bulgaricus*, *Streptococcus thermophilus* bacteria found in yogurt and *Saccharomyces cerevisiae* yeast found in bread dough [17, 28]. In a study, it was stated that during fermentation (3 days), *Lactobacillus* spp. in tarhana decreased from 6,47 cfu/g to 5,44 cfu/g and total mesophilic bacteria decreased from 6,43 to 5,95 cfu/g [20].

### IV. Nutritional Feature of Tarhana and its Effects on Health

Due to the foods such as yogurt, chickpeas, flour (wheat, corn etc.) in tarhana, it is a very nutritious food in terms of protein, carbohydrate and energy [16, 29]. Tarhana has a rich composition such as protein, especially in mineral substances; calcium, iron, sodium, potassium, magnesium, zinc, copper, organic acids, free amino acids, vitamin A, thiamine, riboflavin and vitamin B12. It is suitable for the nutrition of young and elder people, especially the patients, and is an easily digestible food because of a fermented food. Tarhana gives 372.3 kcal / 100 g of energy and is an appetizing, digestible, intestinal flora regulator [6, 20, 30, 31]. The composition of tarhana is given in Table 5. In a study [20], the composition of tarhana has determined as acetaldehyde 136.3%, diacetyl 18%, calcium 2679 mg / kg, manganese 32.3 mg / kg, zinc 44 mg / kg, iron 97 mg / kg, sodium 21492 mg / kg, potassium 5948 mg / kg, magnesium 1582 mg / kg and copper 10 mg / kg. Tarhana is a very good source of calcium, iron and zinc. Lysine and threonine amino acids, which are missing in the wheat flour, have reached a balanced amount in tarhana, due to its presence in yogurt [7]. It has been reported that lactic acid is the most common as acid in the composition of tarhana, as well as an insignificant amount of acetic, citric and propionic acid [17]. In a study [17], the total organic acid of Maraş type tarhana is determined as 1,23-2,42%, lactic acid 0,87-1,53%, pyruvic acid 0,16-0,40% and acetic acid 0,20-0,49%. In another study [12]; ascorbic acid 17,8 mg/kg, niacin 12,4 mg/kg, pantothenic acid (vitamin B5) 5,3 mg/kg, pyridoxine (vitamin B6) 0,38 mg/kg, thiamine (vitamin B1) 4,7 mg/kg, folic acid 0,40 mg/kg and riboflavin (vitamin B2) 1,8 mg/kg. Some properties of tarhana: pH 3,5-4,0 [18], pH 4,3-4,8 [32], acidity 1,8-2,1% [32], crude fiber 2,98% [20], 0,01-3,1% [33]. Aroma active ingredients of tarhana [31]:

Aldehydes (hexanal, furfural, methional, benzaldehyde, octanal, phenylacetaldehyde, (E)-2-octenal, (E,Z)-2,6-nonadienal, (E,E)-2,4-nonadienal, β-cyclocitral, (E)-2-decenal, (E,Z)-2,4-decadienal, (E,E)-2,4-decadienal, geranial, (E)-2-undecenal, β-sinensal, α-sinensal,), Esters (ethyl octanoate, linalyl acetate, bornyl acetate), Ketones (octen-3-one, 1, geranylacetone, B-ionone), Alcohols (hexanol, 1,2-phenylethanol, linalool, nonanol, 1,citronellol), Sulfur compound (dipropyl disulfide), other (naphthalene).

Studies are also carried out to improve the composition of tarhana and to give probiotic properties [34, 35].

TABLE. 5. THE COMPOSITION OF TARHANA.

Reference	drymatter (%)	protein (%)	ash (%)	salt (%)	fat (%)
Tarhana [20]	38,95	16,79	8,94	6,48	3,92
Tarhana (40 sample), [18]	90,4- 95,4	8,8- 26,3	-	1,4- 7,4	1,4- 12,8
Dried tarhana [17]	86,58- 87,62	14,48- 15,60	8,61- 8,79	8,00- 8,17	2,35- 3,14
Frozen tarhana [17]	54,48- 58,45	14,48- 15,57	8,55- 8,86	7,95- 8,15	2,28- 3,15
Tarhana [32]	87,9- 94,1	12,9- 19,2	2,9- 8,2	-	3,3- 5,7
Tarhana (134 sample), [33]*	86,1- 93,6	12,0- 29,9	1,4- 14,2	0,56- 10,4	1,6- 18,2

\* Quoted from [7].

### V. Conclusion and Suggestions

Central Asia, on which the history of the Turks is based, is the geography where the culinary culture was formed together with the Chinese. Cereals and meats are important foods in Turkish cuisine. Soup is an indispensable dish in Turkish table, traditionally prepared tarhana soup is a very nutritious meal due to the foods used in its production (sour yogurt, flour, wheat, vegetables, meat, chickpeas, etc.). Tarhana production of many parts of Turkey according to the materials used vary from region to region. Today, the demand for escape from fast food consumption and traditional nutrition is increasing day by day. The time people spend to preparing and eating food is gradually decreasing. For these reasons, it is necessary to differentiate the production of foods made from natural raw materials such as tarhana, which are important in terms of nutrition, and containing nutrients such as vitamins, amino acids, etc. and to be made according to today's needs (probiotic tarhana, instant tarhana, etc.). It is thought that it will be appropriate to produce tarhana production especially with probiotic foods (kefir, etc.) and to make instant tarhana soup suitable for fast consumption.

### References

- [1] J.A., Ceylan, Ö., Esgin, B. Başpınar, and A.Ö. Özcelik. Cuisine culture of Mesopotamia, Anatolia and Turkish. Chapter 5. In: Recent Studies in

- Health Sciences. Ed: P.M. Chernopolski, N.L. Shapekova, B. Sançar and B. Ak. St. Kliment Ohridski University Pres. ISBN: 978-954-07-4760-6. Sofia. 2019.
- [2] N. Cekal. Traditional foods of Turkish cuisine. *The Social Sciences*, 2014, 9(1), 1-6.
- [3] Y. Ertaş and M. Gezmen-Karadağ. Turkish cuisine in healthy nutrition. *Gümüşhane University Journal of Health Sciences*, 2013, 2(1), 117-136.
- [4] Y. Solmaz and D.D. Altuner. Evaluation of Turkish cuisine and dietary habits. *Journal of Saffron Culture and Tourism Researches*, 2018, 1, 3, 108-124.
- [5] S. Ötleş, B. Özçelik, F. Göğüş and F. Erdoğan. Traditional foods in Turkey: general and consumer aspects. Chapter 6. In: *Traditional Foods*, Ed: K. Kristbergsson, J. Oliveira. Springer Science+Business Media, New York. 2016. Doi:10.1007/978-1-4899-7648-2\_6
- [6] N. Çekal and B. Aslan. Tarhana as a gastronomic value and its significance in the geographical indication. *Journal of Contemporary Tourism Research*, 2017, 1(2), 124-135.
- [7] O. Daglioglu. Tarhana as a traditional Turkish fermented cereal food. Its recipe, production and composition. *Nahrung*, 2000, 44, 2, 85-88.
- [8] N. Acar Tek and M.S. Sürücüoğlu. The first published Turkish cookery book "Melceü't-Tabbâhin". *Gazi Turkiyat Journal of Turkology Research*, 2014,14, 225-229.
- [9] F. Halıcı. Ali Eşref Dede's Food Booklet. Ataturk Cultural Center Publication, Number:62. 1992. ISBN: 975-16-0512-1.
- [10] A. Yıldırım. Qualitative research methods. *Education and Science*, 1999, 23, 112: 7- 17.
- [11] A.Ü. Alçay, S. Yalçın, K. Bostan and E. Dinçel. Dried foods from Middle Asia to Anatolia. *Journal of Anadolu Bil Vocational School of Higher Education*, 2015, 37, 83-93. Doi:10.17932/IAU.ABMYOD.2006.005.
- [12] R. Ekinci and Ç. Kadakal. Determination of seven water-soluble vitamins in tarhana, a traditional turkish cereal food, by high-performance Liquid chromatography. *Acta Chromatographica*, 2005, 15, 289-297.
- [13] H. Yaşar and S. Melek. *Foods and Nutrition*. Nobel Publishing. ISBN: 975-591-432-3. Ankara, Turkey. 2003. (in Turkish).
- [14] D. Yönel, Ş. Karagöz and M. Güllü. Production and varieties of tarhana. 3rd International West Asia Congress of Tourism Research. (IWACT). 27- 30 September 2018, Van, Turkey. 193-204.
- [15] TS, Turkish Standards Institute, TS 2282, Tarhana Standard, 30.12.2004.
- [16] N. Barı. *Alaturka Blessings*. Tablet Bookstore. Konya, Turkey. 2007. (in Turkish).
- [17] O. Bozkurt and O. Gürbüz. Comparison of lactic acid contents between dried and frozen tarhana. *Food Chemistry*, 2008, 108, 198–204.
- [18] S.A. Gök, A.C. Sezgin and F. Yıldırım. Evaluation of the Maras tarhana in gastronomy. *Aydın Gastronomy*, 2017, 1,1, 61-70.
- [19] Ş. Akbaş and H. Coşkun. An evaluation on tarhana production and properties. Turkey 9th Food Congress, 24-26 May 2006, Bolu, Turkey. 703-706.
- [20] M. Erbas, M. Certel and M.K. Uslu. Microbiological and chemical properties of tarhana during fermentation and storage as wet—sensorial properties of tarhana soup. *LWT*, 2005, 38, 409–416.
- [21] Türkpatent, Turkish Patent and Trademark Office. <https://www.turkpatent.gov.tr/TURKPATENT/geographicalRegisteredList/andhttps://www.ci.gov.tr/cografisaretler/liste?il=&tur=44&urunGrubu=51&adi=tarhana>, date of access:20.04.2020.
- [22] F. Coşkun. History of tarhana and varieties of tarhana in Turkey. *Electronic Journal of Food Technologies*, 2014, 9 (3), 69-79.
- [23] Url-1: <https://www.ci.gov.tr/cografisaretler/liste?il=&tur=44&urunGrubu=51&adi=tarhana> date of access:20.04.2020
- [24] Url-2: <http://www.dortdivanortakoy.com/cakmak-tarhanasi-nasil-yapilir/> date of access:20.04.2020
- [25] Url-3: <https://www.youtube.com/watch?v=pr3GpWi2CLs> date of access:20.04.2020
- [26] M. Erbas, M.K. Uslu, M.O. Erbas and M. Certel. Effects of fermentation and storage on the organic and fatty acid contents of tarhana, a Turkish fermented cereal food. *Journal of Food Composition and Analysis*, 2006, 19, 294–301.
- [27] İ.Y. Sengun, D.S. Nielsen, M. Karapinar and M. Jakobsen. Identification of lactic acid bacteria isolated from tarhana, a traditional Turkish fermented food. *International Journal of Food Microbiology*, 2009, 135, 105-111.
- [28] N. Bilgili and S. İbanoglu. Effect of wheat germ and wheat bran on the fermentation activity, phytic acid content and colour of tarhana, a wheat flour–yogurt mixture. *Journal of Food Engineering*, 2007, 78(2), 681–686.
- [29] C.E. Tamer, A. Kumral, M. Aşan and İ. Şahin. Chemical compositions of traditional tarhana having different formulations. *Journal of Food Processing and Preservation*, 2007, 31, 116-126.
- [30] M. Hayta, M. Alpaslan and A. Baysar. Effect of drying methods on functional properties of tarhana: a wheat flour–yogurt mixture. *Journal of Food Science*, 2002, 67, 2, 740-744.
- [31] O. Ozdemir, D. Gocmen, A.Y. Yildirim Kumral. A traditional Turkish fermented cereal food: tarhana. *Food Reviews International*, 2007, 23, 107–121, Doi:10.1080/87559120701224923
- [32] Ş. İbanoğlu, P. Ainsworth, G. Wilson and G.D. Hayes. The effect of fermentation conditions on the nutrients and acceptability of tarhana. *Food Chemistry*, 1995, 53, 143-147.
- [33] B. Siyamoglu. Research on the structure and composition of Turkish tarhana. Ege University Press. Pub. Number:44, Izmir, Turkey, 1961. (in Turkish).
- [34] A. Avcı, F.A. Akçay, C. Can and S. Demir. Determination of some properties of tarhanas produced by using corn flour and kefir. *Food and Health*, 2019, 5(3), 168-174. Doi.org/10.3153/FH19018
- [35] A.Ş. Demirci, I. Palabıyık, S. Ozalp and G. Tırpancı Sivri. Effect of using kefir in the formulation of traditional tarhana. *Food Sci. Technol, Campinas*, Ahead of Print, 2018. Doi:doi.org/10.1590/fst.29817