CHAPTER 16

Food, nutrition, and health in Turkey, the European part

Birsen Bulut-Solak
Gastronomy and Culinary Arts Department, Tourism Faculty, Alaaddin Keykubat Campus, Selcuk University, Konya, Turkey

16.1 Introduction

All over the world there is an increasing consumer interest for traditional food products (TFs). TFs not only that they represent an expression of people's culture and lifestyle, they are also a reflection of the country's history, geography, climate, and agricultural landscape (Panagou, Nychas, & Sofos, 2013; Trichopoulou, Soukara, & Vasilopoulou, 2007). TFs are foods that are passed from one generation to the next, particularly those that are minimally processed, have rich flavor, and no additives are a good source of nutrients with great potential in maintaining health and preventing disease. Owing to their varied organoleptic properties, TFs play an important role in people's diet across the world (Kabak & Dobson, 2011).

Turkey has various types of TFs. These are important elements of the country's cultural heritage. Unfortunately some TFs have started to be forgotten today. On the other hand, there is also a lack of research carried out to investigate the health and nutritional values of Turkey's TFs. Because of these reasons, eight popular TFs for the European part of Turkey (Thrace) were presented in this book chapter, focusing on some of their properties, including their manufacturing technologies, nutritional, and health aspects. Furthermore, there are limited reports in literature regarding the health benefits, microbiological processes, and standard preparation methods for Thracian foods. Thus, this chapter also aims to report general literature aspects for them as far as possible.

16.2 Historical overview

Turkey is very rich in TFs because of the grand Turkish cuisine, which has been shaped by various other cultures like Persian, Hittites, and Byzantines for many centuries. Turkish TFs are a mixture of nutrients; many of them are rich in phenolic compounds, vitamins, minerals, essential oils, etc. The Thracian people have long recognized the importance of TFs in their lives, their antimicrobial properties, and health benefits. Today, many different types of traditional beverages and foods in the Thrace region are produced

Nutritional and Health Aspects of Food in the Balkans
DOI: https://doi.org/10.1016/B978-0-12-820782-6.00008-6

as homemade, by restaurants, and small manufacturers. These foods are largely the heritage of the Ottoman cuisine, which can be described as a fusion and refinement of the Central Asian, Middle Eastern, Eastern European, Greek, and Balkan cuisines (Ugurlu, 2015).

16.3 Geography and the natural agricultural landscape

The Thrace region of Turkey, gateway of Turkey to Bulgaria and Greece, is also known as Rumeli (formerly Peninsula Romaine). The Thrace cities are Istanbul (formerly Constantinople), Edirne (formerly Adrianople), Tekirdag (formerly Rodosto), Kirklareli (formerly Saranta Elegies/Forty Churches [Kirk Kilise]), and Gelibolu (Gallipoli), while Istanbul is generally considered as a separate entity (Ugurlu, 2015). The Thrace region is characterized by rich soil and favorable climate, which allow the cultivation of almost all varieties of grapes, and play a significant role in the quality of wine and grape products. The grapes are consumed fresh, conserved, or as part of molasses, wine, and *bulama* (solid molasses). Wine production in Tekirdag is very common. The first winery was opened in Tekirdag in 1931 (Ozay, Akyol, & Azabagaoglu, 2005). The grape varieties in this region are Hamburg Muscatel, Semillon, Yapincak, Cinsault, Cabernet Sauvignon, Sauvignon Blanc, Merlot, Muscat, Riesling, Karalahana, Narince, Kleret, Gamay, Emir, Kalecik Karasi, and Papaz karasi (Gulcu, 2010). Vineyards constitute 0.51% of the total cultivated agricultural land in the Thrace region (TUIK, 2018). Besides vineyards, arable lands for (1) vegetables, (2) fruits, (3) beverages and spice crops, and (4) olive trees constitute (1) 96.68%, (2) 1.16%, (3) 1.04%, and (4) 0.42% of the total cultivated agricultural area in the Thrace region, respectively (TUIK, 2018). A wide variety of crops, vegetables, and fruits are grown, including wheat (*Triticum aestivum L.*), sunflower (*Helianthus annus L.*), rice (*Oryza sativa L.*), corn (*Zea mays L.*), barley *(Hordeum vulgare L.)*, oat (*Avena sativa L.*), colza (*Brassica napus L.*), olive (*Olea europaea L.*), sugar beet (*Beta vulgaris L.*), sesame (*Sesamum indicum L.*), eggplant (*Solanum melongena L.*), onion (*Allium cepa L.*), garlic (*Allium sativum L.*), gourd (*Cucurbita* spp.), tomato (*Lycopersicon esculentum L.*), bean (*Phaseolus vulgaris L.*), purslane (*Portulaca oleracea L.*), melon (*Cucumis melo L.*), and watermelon (*Citrullus vulgaris L.*) (Republic of Turkey Ministry of Agriculture and Forestry, n.d.). Ipsala rice in Edirne has protected designation of origin (PDO code: *c*2012/070) status (Republic of Turkey Ministry of Industry and Technology, n.d.).

16.4 Culture, traditions, and typical traditional foods

The Turkish culture is exciting, and the cuisine is exotic with influences from many countries, a testimony to the country's historic past. Effects of the Balkan culture and traditions can be seen on the lifestyle, outfits, and food habits of the inhabitants of the Thrace region in Turkey, which has gained a great cultural importance since the times

of the Ottoman Empire. Thracian gastronomy shares many foods with the Balkans, which are mostly a legacy of the Ottoman cuisine (Balci Akova, 2012; Ugurlu, 2015).

The most common foods known in the Thrace region include fermented nonalcoholic beverages (*boza* and *hardaliye*), an alcoholic beverage (*raki*), a cereal-based fermented food (*tarhana*), confectionaries (almond paste [*badem ezmesi*] and cheese halva [*peynir helvasi*]), a meat product (Tekirdag meatball [*Tekirdag köftesi*]), and a dairy product (Edirne white brined cheese [*Edirne beyaz peyniri*]). Their preparation may vary, albeit to a limited extent, from one region to another, even among households in similar geographical counties.

16.4.1 Fermented nonalcoholic beverages

16.4.1.1 Boza

The traditional fermented Turkish beverage, *boza*, is a highly viscous drink. It is made from cereals such as millet, rice, oats, maize, barley, and wheat flours (Arici & Daglioglu, 2007; Zorba, Hancioglu, Genc, Karapinar, & Ova, 2003), but the best *boza* with high quality and taste is prepared from millet flour (Arici & Daglioglu, 2007). It is sweetened with sugar or saccharine (Hancioglu & Karapinar, 1997). Consumed in Turkey and some other countries in the Balkans, this is a slightly acidic and low-alcoholic beverage with a pale yellow color and a sourish or sweetish taste. Due to its pleasant flavor and high nutritional value, *boza* has become popular to consumers of all ages, and is generally consumed in the winter (Blandino, Al-Aseeri, Pandiella, Cantero, & Webb, 2003).

In the old days, *boza* was produced and consumed with slight differences according to the recipes from the East European countries, the Balkans, and Egypt (Arici & Daglioglu, 2007). *Boza* was recorded in clay tablets as a stimulant and a medicine. The history of *boza* production dates back to around 6000–7000 years BCE. The name *boza* (in Turkish) comes from the Persian word *buze* meaning millet. The Turks who lived in Middle Asia called this beverage *bassoi*. *Boza*, which was first produced in Central Asia, was taught to other people by the Central Asian Turks. During the expansion periods of the Seljuk State and Ottoman Empire, they introduced *boza* to the inhabitants of the new territories (Evliya, 1990; Uylaser, Korukluoglu, Gocmen, & Sahin, 1998). However, ancient *boza* is different from Turkish *boza*, which has high alcohol content (up to 7% by volume). Its consumption was initially widespread in the Islamic countries, but production was prohibited in the 18th century because of its high alcohol content. It is still produced and consumed widely in Anatolia (the Asian part of Turkey) (Arici & Daglioglu, 2007; Evliya, 1990). According to Turkish Standards, *boza* can be classified depending on its acid content as sweet (total lactic acid content of 0.2%–0.5%) or sour *boza* (total lactic acid content of 0.5%–1.0%) (Turkish Standards Institution, 1992).

The traditional manufacturing technique for *boza* is well established. The selected grains are sorted out of foreign matter, milled to the size of semolina, and then sieved

to remove the hull and bran. The material is cooked in an open or steam-jacketed vessel after the addition of water. During boiling, the mixture absorbs water and therefore hot water is added several times until the end of the process. Boiling is finished when a homogenous pulp is obtained, which takes approximately 1−2 h depending on the cooking temperature and raw material. The cooked material is transferred into broad shallow pans for cooling to prevent accumulation of cream on the surface. While cooling, the mixture is percolated, afterward cold water and sugar or saccharine (15%−20%, w/w) are added. The mixture is then fermented by adding prefermented *boza*, sour dough, or yogurt as an inoculum at levels of 2%−3% (v/v) at 30°C for 24 h. Prefermented *boza*, sourdough, or yogurt are rich in *Lactobacillus* (*Lb.*) spp. and yeasts (Yegin & Uren, 2008). During fermentation, free acidity of *boza* increases from 0.02% to 0.27% leading to a drop in pH from 6.13 to 3.48, which helps to inhibit the growth of harmful bacteria such as *Bacillus cereus* (Guven & Benlikaya, 2005). The spoilage and pathogenic microorganisms are further inhibited by antimicrobial substances produced by lactic acid bacteria (LAB), which help the product get its characteristic taste (Hancioglu & Karapinar, 1997). After fermentation, *boza* is cooled to 4°C and bottled in suitable glass or plastic containers (Yegin & Uren, 2008). After opening, the beverage should be consumed within 3−5 days (Evliya, 1990; Uylaser et al., 1998). However, it is also acceptable for consumption during fermentation until the pH drops to about 3.5 (Altay, Karbancioglu-Guler, Daskaya-Dikmen, & Heperkan, 2013). There are no statistical figures on the production of *boza* in Turkey because this is mostly produced in house or as a small-scale family business rather than at an industrial level.

Boza is a valuable fermented beverage that contributes to human nutrition (Arici & Daglioglu, 2007). Fermentation improves the organoleptic quality and digestibility of *boza*, making it a nutritious and healthy beverage (Meric, 2010). Compositional characteristics of *boza* samples are as follows: total lactic acid (0.13%−0.47%), fat, total dry matter (5.57%−29.82%), protein (0.2%−2.7%), total added sugar (10.64%−22.59%), ash (0.02%−0.17%), fiber, pH (3.16%−4.59), ethyl alcohol (ND−0.39%), and vitamins. The vitamins thiamine, niacin, vitamin B6, and pantothenic acid reach values of 4.78, 30.51, 14.00, and 2.07 mg/L, respectively, at the end of storage (Arslan, Durak, Erbas, Tanriverdi, & Gulcan, 2015; Meric, 2010; Uylaser et al., 1998, 2009; Yegin & Uren, 2008). Its lactic acid content has positive effects on digestion and intestinal microflora (Arici & Daglioglu, 2007). Moreover, *boza* helps to balance blood pressure, to increase milk production in breastfeeding women, and to facilitate digestion. It is also a valuable beverage for physically active individuals and vegetarians as it contains vitamins A, C, E, and four types of vitamin B, which represent a good substitute for dairy-based drinks (Petrova & Petrov, 2011). *Boza* is also regarded as a rich source of probiotic species such as *Lb. rhamnosus*, *Lb. plantarum*, *Lb. fermentum*, and *Lb. pentosus* (Altay et al., 2013; Todorov et al., 2007).

The compositional values of *boza* are affected by the utilization of different types and amounts of cereals and cereal products as raw material, the fermentation process parameters, and natural microbiota. Due to the activity of the fermentation microorganisms, biogenic amines can occur in *boza*, ranging between 25–69 mg/kg and 1.67–101.14 mg/kg according to Yegin and Uren (2008) and Cosansu (2009), respectively. Putrescine, spermidine, and tyramine were detected in *boza* samples. Of all, tyramine had the highest levels (up to 82.79 mg/kg), which can cause adverse health effects for consumers who are taking monoamine oxidase inhibitors drugs against Parkinson's disease (Altay et al., 2013). Further research is needed to assess the quality, stability, and functional properties of *boza* (Altay et al., 2013).

16.4.1.2 Hardaliye

Hardaliye, a type of grape-based nonalcoholic traditional fermented beverage, has been considered to be an indigenous beverage in the Thrace region of Turkey since 1839 (Altay et al., 2013). Because of LAB floras, *hardaliye* has been classified as a nondairy beverage (Prado, Parada, Pandey, & Soccol, 2008). It is mainly produced from red grape juice (Papazkarasi [blue black grapes], Alphonse Lavallee [red aromatic grapes], or Cardinal [red sweet grapes]) with the addition of different concentrations of whole/crushed or heat treated black mustard seeds (*Brassica nigra* L.), sour cherry leaves (*Prunus cerasus* L.), and/or benzoic acid, which is used as preservative during production. *Hardaliye* is also known as a lactic acid fermented beverage. Its microbiota is mainly composed of LAB, especially *Lb. paracasei* subsp. *paracasei*, *Lb. casei* subsp. *pseudoplantarum*, *Lb. pontis*, *Lb. brevis*, *Lb. acetotolerans*, *Lb. sanfrancisco*, and *Lb. vaccinostercus*. There is only one study on the microbiology of *hardaliye* fermentation in the literature. The LAB count of *hardaliye* ranges from 1×10^2 to 4×10^4 CFU/mL (Arici & Coskun, 2001).

Limited studies on *hardaliye* have been reported. The current literature presents the traditional techniques for producing *hardaliye*. *Hardaliye* in Kirklareli has got a protected geographical indication (PGI code: c2013/033) status (Republic of Turkey Ministry of Industry and Technology, n.d.). For traditional *hardaliye* production, jars of glass or plastic and wooden barrels are preferably used. The grapes, black mustard seeds (preferably crushed mustard seeds), and sour cherry leaves are washed separately. The jars or barrels are filled with the ingredients in a specific order. Firstly, the crushed grape juice is added, followed by 0.2% w/v crushed raw mustard seeds, then by the sour cherry leaves. Additionally, 0.1% (w/v) benzoic acid is added to inhibit or decrease the alcohol production by affecting the yeast growth. Finally, the ingredients are allowed to ferment for 5–10 days at 20°C–22°C. The mixture is then filtered with a sieve and the resulted liquid stored in suitable containers at 4°C (Arici & Coskun, 2001). *Hardaliye* is consumed either fresh or following aging. The pH of the final product should be between 3.21 and 3.97 at 4°C until it is consumed (Kabak & Dobson, 2011).

Health benefits associated with *hardaliye* consumption are related to the etheric oils present in mustard seeds that block the formation of alcohol by inhibiting yeast growth. They also contribute to the special flavor of *hardaliye*. A component of mustard seeds (i.e., sinigrin) has been identified as a suppressing agent of carcinogenesis that has triggered an interest toward this beverage (Coskun, 2017). *Hardaliye* helps to prevent coronary heart disease and supports the digestive system. In addition, the fermentation process improves its nutritional value through the synthesis of vitamins, essential amino acids, digestibility, mineral bioavailability, detoxification, destruction of phytates, and tannins. Mustard oils of *hardaliye* have medicinal effects on common cold, circulatory disorders, bronchitis, as well as antimicrobial properties. *Hardaliye*'s high antioxidant capacity decreases plasma lipidperoxidation parameters and serum homocysteine concentrations due to its phenolic content (Coskun, 2017). Regarding the addition of the benzoic acid to *hardaliye*, there are no studies available on adverse health effects.

16.4.2 Alcoholic beverage—*Raki*

Raki is a traditional Turkish alcoholic beverage with aniseed (*Pimpinella anisum* L.). It is consumed by the people in Turkey and other countries, and the most preferred spirit among other distilled spirits in Turkey. Aniseed is only used for aromatization at a ratio of 6%–10% (w/v) (Yilmaztekin & Cabaroglu, 2011). Many different types of *raki*, which are well described in the scientific literature, are available in Turkey (Zat, 2011). The name *raki* comes from the word *razaki*, which is a kind of grape used for *raki* production. Its history goes back to 300 years ago. It is not known exactly where or when *raki* was first produced. A famous Turkish traveler, Evliya Celebi, mentioned *raki* in his book during his voyages in 1630. According to his travel book, ancient people produced their own *raki* in small towns (Zat, 2011).

Raki is produced from raw materials including grapes, raisins, and molasses, by double or triple distilling of (1) suma, which is a distillate of fermented raw materials, or (2) suma mixed with agricultural ethanol, and flavored with aniseed (Turkish Food Codex, 2005). *Raki* has a specific taste and flavor. Distillation takes place in copper stills and produces three groups of product: initial, middle, and final (Fidan, Denli, & Anlı, 1996). Its composition might vary depending on the type, origin, and maturity of the grapes, the ripening conditions, the soil characteristics, geographical conditions, production process (e.g., fermentation, distillation, dilution, aging), and additives used (e.g., for coloring and flavoring). The many varieties of grapes used for *raki* production such as Sultania, Misket, Bogazkere, Papaz karasi, Semillion, Dimrit, Yapinacak, and Muscat Blanc (Fidan & Sahin, 1993) could affect consumer selections (Arrizon, Calderon, & Sandoval, 2006; Cabaroglu & Yilmaztekin, 2011; Jurado et al., 2007). *Raki* has minimum 40% (v/v) alcoholic content. Suma constitutes a minimum of 65% of the total

alcohol in the final product and the rest of 35% comes from added agricultural ethanol. White refined sugar must be used in the preparation phase for alcohol fermentation. *Raki* contains less than 10 g/L sugar. Volatile compounds must be at a minimum of 100 g/hL in 100% (v/v) alcohol. The methanol content must be at a maximum of 150 g/hL in 100% (v/v) alcoholic final product, while the amount of anethole that comes from aniseed herb must be at a minimum of 0.8 g/L of product. *Raki* is finally rested at least 1 month before filling. After the second distillation, *raki* is aged in oak barrels from 20 days to 3–4 months (Yucesoy, 2011).

It has protected its specific characteristic of being a traditional spirit since 1930. It was awarded with a geographical indication status (PGI code: c2009/007) by the European Union in 1999 to protect its identity and to distinguish it from similar spirits (Fidan & Anli, 2002; Republic of Turkey Ministry of Industry and Technology, n.d.; Yilmaztekin & Cabaroglu, 2011). A special famous *raki* for the Thrace region, Tekirdag *raki*, is similarly made from dry and/or fresh grape varieties such as Papaz karasi, Semillion, etc., and flavored with aniseed. Its production is similar to general *raki* production, but there is no detailed data on Tekirdag *raki* production is available (Ozkandan, 2009). In addition, only a limited number of studies have been conducted to assess the health effects of *raki* consumption in Turkey. Nutritional and dietary habits like excessive alcohol consumption have been associated with oral and pharyngeal cancers, which have been reported to occur mostly in younger males from Eastern Europe. The study of Guneri et al. (2005) found that alcohol consumption was higher in cancer patients and that 26.92% consumed alcohol 6–7 days per week. Of the cancer patients examined, 76.92% consumed mostly *raki*. However, the consumption of *raki* was also reported by 50% of the healthy controls, who also drank red wine (18.75%) (Guneri et al., 2005). In another study, 75.3% of chronic alcohol consumer males in Turkey were found to have sexual problems. It was also reported that 54.6% of the alcohol addicted males over the age of 40 experienced erectile problems (Dissiz and Oskay Yesiltepe, 2011).

16.4.3 Cereal-based fermented food—*Tarhana*

Tarhana is a dried cereal-based fermented mixture prepared by kneading wheat flour, yogurt, and other secondary ingredients (e.g., yeast, a variety of cooked vegetables [tomatoes, onions, pepper, paprika], chickpeas, cheese, salt, and spices [mint, black pepper, red pepper, dill and clove], etc.) to form a consistent dough, followed by fermentation at 30°C in a closed container for 1–7 days depending on the desired organoleptic properties (Ozdemir, Gocmen, & Kumral, 2007). While its production method and ingredients may vary from region to region, cereals and yogurt are main ingredients. *Tarhana* plays an important role in the Thracian and Turkish diets because of its high nutritional value and long shelf life due to its low pH (3.5–5.0) and moisture content (6.4%–13.9%). Organic acids and bacteriocins formed during fermentation have bacteriostatic effect on pathogens and spoilage microorganisms

during storage (Tamer, Kumral, Asan, & Sahin, 2007). *Tarhana* can be stored without spoilage for 1–2 years between 10°C and 30°C (Ozdemir et al., 2007).

Tarhana has been a home-made product for hundreds of years in Anatolia (Kabak & Dobson, 2011). It represents an important part of the Turks diet as it provides a good source of proteins, vitamins, minerals, organic acids, and free amino acids. *Tarhana* can be produced as a dry or wet product. Dry *tarhana* is in a powder form (i.e., granules with a diameter <1 mm) that can be stored for 1–2 years without any sign of deterioration (Blandino et al., 2003). Wet *tarhana* is a dough obtained after fermentation that can be stored for up to 6 months at 4°C (Dalgic & Belibagli, 2008). After reconstitution with hot water, both types of *tarhana* are commonly consumed at lunch or dinner as a thick soup, usually with bread and vegetables in winter (Daglioglu, 2000). *Tarhana* can also be consumed as a snack after it has been dried, as flakes, or as nuggets (Erbas, Uslu, Erbas, & Certel, 2006). Similar fermented products exist in the Balkans and known as *Trahana/Trahanas* (Daglioglu, 2000).

Tarhana has an acidic and sour taste with a strong yeast flavor (Ibanoglu & Ibanoglu, 1999). The amount and type of ingredients used for *tarhana* production may affect both its nutritional content and sensory attributes (Ibanoglu & Ainsworth, 2004).

The composition of *tarhana* varies within the following ranges: 12.0%–29.9% protein, 41.8%–77.5% carbohydrates, 1.6%–18.2% fat, 0.1%–3.1% fiber, 0.56%–10.4% salt, and 1.4%–14.2% ash. It is also a good source of minerals (Ca^{+2}, Mg^{+2}, and K^{+}) (Ozdemir et al., 2007). Its practical nutritional importance comes from the inclusion of milk proteins in the diet based on cereal proteins (Blandino et al., 2003). *Lb. delbrueckii* subsp. *bulgaricus* and *Saccharomyces cerevisiae* are the primarily microorganisms involved in the fermentation of *tarhana*. The fermentation process gives the food its characteristic taste and flavor through the production of lactic acid, ethanol, carbon dioxide, and some other organic compounds (Kabak & Dobson, 2011). During fermentation, organic acids such as lactic acid, acetic acid, formic acid, a variety of vitamins including C, B3, B5, and B9, minerals, and high-quality proteins prolong the fermentation duration, which give the final product a higher nutritional value and digestibility than the raw product. The digestibility of the crude ash increases from 68.32% in dough to 82.07% in the final product. The amount of the digestible protein increases up to 95.12% as a result of the fermentation procedure. For these reasons, *tarhana* is considered a good source of nutrients for children, pregnant women, and elderly people (Bilgicli & Turker, 2004).

16.4.4 Confectionaries

16.4.4.1 Almond paste (Badem ezmesi)

In Turkey, almond paste is traditionally made in Edirne, once the capital of the Ottoman Empire for 92 years. In 1520, this paste was a royal delight mostly used in palace during the Ottoman era. Edirne *Badem ezmesi* has applied for getting a protected geographical indication status (application file number: c2013/003)

(Republic of Turkey Ministry of Industry and Technology, n.d.). Turkish almond paste, a specialty product, is one of the most preferred and expensive almond products, which is made using traditional grinding equipment. It is also economically valuable and a nutritious product due to the inclusion of almonds, sugar, and a small amount of water (Capanoglu and Boyacioglu, 2008, Faid, Bakhy, Anchad, & Tantaoui-Elaraki, 1995). The steps of manufacturing traditional Turkish almond paste are: washing and cooking of raw almonds in boiling water for 5 min, peeling manually the outer skins of almonds, drying and mixing with icing sugar, and grinding the mixture using a special designed mill. This grinding step is repeated three times to obtain a desired particle size (i.e., 1.5–2.0 mm diameter). Finally, the mixture is manually kneaded with addition of a small amount of water on the marble bench in order to form a homogenous paste mixture. The paste is shaped into rolls and cut into 4 cm pieces. Icing sugar is added to about 20%. The stability of the paste is particularly short during storage because of its high oil content. Oxidative rancidity and oil separation are major quality problems that affect its shelf life (Capanoglu & Boyacioglu, 2008; Cunningham, 1999). The general composition of *badem ezmesi* is as follows: 9.0%–10.1% protein, 25.5%–27.7% fat, 47.8%–52.9% carbohydrate, 36.2%–37.7% total sugars, 10.1%–14.0% water, 4.8% total dietary fiber, 172 mg Ca^{+2}, 9 mg Na^{+}, 2.6% total saturated fatty acids, and it has no cholesterol (Capanoglu & Boyacioglu, 2008; USDA, 2020).

Almond (*Amygdalus communis* L.) and its products are known to be healthy foodstuffs due to their unsaturated fatty acids profile such as oleic acid, linoleic acid, high levels of α-tocopherol (Jambazian, Haddad, Rajaram, Tanzman, & Sabate, 2005; Kornsteiner, Wagner, & Elmadfa, 2006), proteins (Aydin, 2003), flavonoids, and fiber components (Capanoglu & Boyacioglu, 2008; Jambazian et al., 2005). The almond kernels have potential positive health benefits in relation to heart disease, diabetes, and obesity (Grundy, Lapsley, & Ellis, 2016) because of their rich content in nutrients and phytochemicals such as protocatechuic acid, methylquercetin, and catechin (Li et al., 2020). On the other hand, the almond paste, which is a mixture of ground almonds and sugar, should be consumed in moderate quantities. It is recommended to consume less than 10% of the calories from added sugars to prevent several diseases including obesity, heart disease, diabetes, and dental caries (Erickson & Slavin, 2015).

16.4.4.2 Cheese Halva (Peynir helvasi)

Cheese is traditionally the main ingredient for producing cheese halva (Unsal, 1997). Cheese halva is a dessert similar to *hosmerim* that is produced in Turkey, so similar that sometimes they both are considered as one and the same product (Demirel, Doyuran, Gultekin, & Guven, 2005). However, it is reported that their constituents and production techniques are different (Demir, 2005). Main constituents of cheese halva are unsalted fresh cheese particularly made from bovine or sheep milk (such as curd or

cottage cheese), eggs, granulated sugar, flour, riboflavin as additive, and oil according to some local recipes (Akpinar-Beyazit, Ozcan, & Yilmaz-Ersan, 2009; Demir, 2005; Demirel et al., 2005; Unsal, 1997). Tekirdag *Peynir helvasi* has applied for getting a PGI status (application file number: c2016/011) (Republic of Turkey Ministry of Industry and Technology, n.d.).

It is mainly manufactured at small-scale family plants according to traditional methods. The information in literature regarding the standard manufacturing process, composition, and quality characteristics for cheese halva is limited. It is generally made from milk (30% w/v) coagulated with rennet at 35°C for 90 min. Coagulation of the milk takes place until the curd reaches a pH of 5.4. The resulted curd is mixed with other ingredients, including flour (14% w/v), granulated sugar (55% w/v), and eggs, then cooked together until a homogenous mixture is obtained. The general composition for cheese halva is as follows: 77.13% dry matter, 4.68% fat, 3.58% protein, 44.22% sugar content, and 1.43%–1.70% total ash. Energy values for cheese halva range between 309.5 and 360.5 kcal/100 g (Aydin, Aksu, Gunsen, Mercan, & Taskanal, 2008). The product is considered a good source of antioxidant compounds such as conjugated linoleic acid (7.13 mg/g) and α-tocopherol (0.73 mg/100 g) (Akalin & Tokusoglu, 2010). This Turkish delicacy, manufactured for 60 years as a commercial product, is consumed alone after lunch as a dessert or combined with ice cream (Akpinar-Beyazit et al., 2009).

16.4.5 Meat products

16.4.5.1 Tekirdag meatball (Tekirdag köftesi)

Tekirdag meatball is a round-shaped meatball prepared from minced beef or lamb sliced from the rib that is grilled over an oak fire. The meat is sourced from livestock animals that are grown in a natural environment on local highlands with specific flora in the Thrace region. For preparing Tekirdag meatball, semolina, egg, salt, black pepper, cumin, thyme, and red pepper flakes are added to the minced meat and kneaded altogether for 30 min. Onions and garlic are chopped into fine pieces and mixed well with the kneaded minced meat before grilling. Tekirdag meatball may be served on a plate or as a wrap. Additionally it is possible to find fast-food type Tekirdag meatball in the city (Ergan-Goynusen, 2011). Tekirdag *köftesi* has applied for getting a PGI status (application file number: c2016/010) (Republic of Turkey Ministry of Industry and Technology, n.d.). It is also possible to come across this meatball in other countries, especially Macedonia and other Balkan countries. It is also grilled in commercial restaurants of most cities in Turkey, especially in the Marmara region of Turkey, and sold by catering companies. Despite its high popularity, Tekirdag meatball is regarded as a food with low profitability (Ergan-Goynusen, 2011; Yasarlar, 2004).

Proximate values for the nongrilled and grilled Tekirdag meatball are as follows: 56.66% and 53.79% moisture, 16.8% and 18.84% protein, 16.07% and 16.72% fat, 2.7% and 3.04% ash, 2.21% and 2.69% salt, and 0.83% and 0.55% foreign matters,

respectively. It is important that grilling is done under hygienic conditions and at correct temperatures (i.e., minimum internal temperature of 71°C) for decreasing the microbial load (i.e., Staphylococcaceae, Enterobacteriaceae) (Yilmaz, 1994).

16.4.6 Dairy product

16.4.6.1 Edirne White Brined Cheese (Edirne Beyaz peyniri)

White brined cheese is originally made from whole sheep milk in the Thrace region of Turkey (Kamber, 2007), however whole milk mixture consisting of sheep milk (∼60%), goat milk (∼30%), and cow milk (∼10%) can also be used. Nowadays, cow milk has come to be more widely used for its production because of the decrease in the number of sheep and goats in the Thrace region (Kamber, 2007; Ozcan & Ovali, 1997; Unsal, 1997). *Edirne Beyaz peyniri* was awarded with a geographical indication status (PGI code: c2004/005) (Republic of Turkey Ministry of Industry and Technology, n.d.). White brined cheese is also produced in the Middle East, Balkans countries, and along the shores of the Mediterranean Sea (Hayaloglu, Ozer, & Fox, 2008; Salameh, Banon, Hosri, & Scher, 2016). Its use in Turkish cuisine is almost imperative. It may be used in many recipes: vegetable and fruit salads, filled pies, as an appetizer for side dish when serving traditional Turkish spirit *raki*, as a topping for or ingredient in cooked rice and tomato-based pastas, as a filling for omelets and pastries, as well as in sandwiches. Mostly it is consumed for breakfast (Durlu-Ozkaya & Gun, 2014).

The general steps for the production of the white brined cheese are presented in Fig. 16.1.

The cheese is kept in a cheese cloth at 19°C−21°C for 25−30 min to allow whey drainage without pressing. The cheese blocks are salted in brine (16%−18% salt w/v) for 2−4 h at 15°C−16°C, and finally ripened in tin cans filled with brine (16%−18% salt w/v) for 1−5 days at 16°C−18°C until pH reaches a value of 4.7−5.0. It is stored at 2°C−4°C for at least 3 months from date of production (Hayaloglu, Guven, & Fox, 2002; Republic of Turkey Ministry of Industry and Technology, n.d.; Salameh et al., 2016). Its microbial flora is initially dominated by *Lactococcus lactis*, but *Lb. plantarum*, *Lb. casei, Lb. fermentum*, while *Lb. brevis* predominate at the end of the ripening stage (Karakus, Borcakli, & Alperden, 1992). The industrial production of cheese in the Thrace region is quite high. Although a large proportion of cheese is produced in modern dairy plants, some producers in rural areas have continued to make their own cheese in the traditional way. *Edirne Beyaz peyniri* has low calories and fat content compared the other types of cheese (i.e., Kashar) (Durlu-Ozkaya & Gun, 2014). It also contains a high amount of B vitamins (Atalay & Erol, 1996), phosphorus and calcium, which can contribute to bone health (Demirci, 1988). Additionally, it contains beneficial LAB bacteria and fatty acids (Akalin, Kinik, & Gonc, 1998). However, this type of cheese is relatively high in sodium (Demirci, 1988).

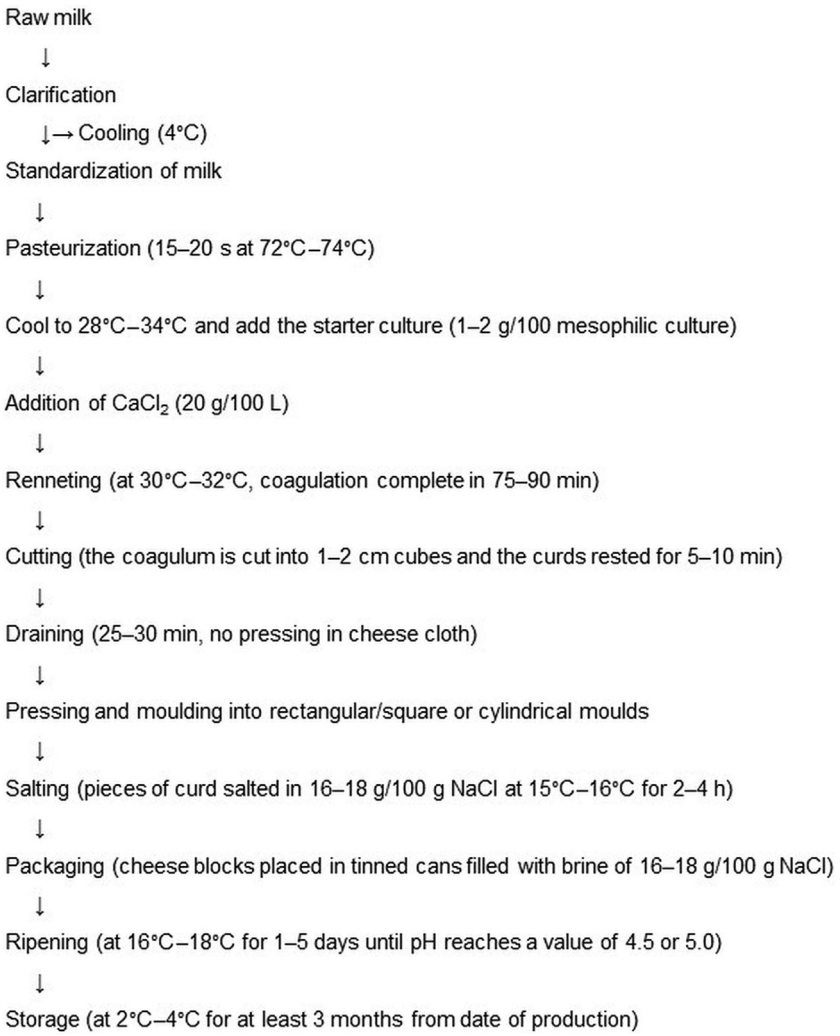

Figure 16.1 A general flowchart for White Brined Cheeses produced industrially.

16.5 Food sustainability in the Thrace region of Turkey

Ensuring food security depends on the sustainability of the food production and consumption. Sustainability can contribute to improving people's quality of life in ways that do not compromise Earth's basic life-support systems for future generations. In the UN Decade of Action on Nutrition 2016−25 is highlighted the urgent need of transforming current food systems to promote healthy, socioculturally, and economically acceptable diets that have low environmental impact (FAO & WHO, 2019). In this regard, Turkey has partnered with FAO and developed the FAO-Turkey Partnership Programme to focus on

food security and nutrition, agricultural and rural development, natural resource management, agricultural policies, and food safety in the country (FAO, 2019). Turkish foods, especially animal protein based foods, have been found to contribute the most to the increase of greenhouse gas emissions and water footprint. Examples are halva, rice dishes, red meat products, kebabs, and meatballs. Therefore, in order to reduce the environmental impact caused by food consumption, it was recommended the consumption of local and seasonal foods, along with a reduction of energy-dense foods and foods of animal origin (Erdogan, 2018).

16.6 Concluding remarks

TFs from Thrace, the European part of Turkey, have been valued since the Ottoman era. However their nutritional and health properties have been only marginally studied. This chapter has presented a selection of the Thracian TFs. These foods are rich sources of nutrients that can provide protection against diseases. Further work is needed to determine the advantages and potential adverse effects (if any) of their consumption. In addition, the manufacturing process of TFs from the Thrace region should be standardized to reduce the current small existing differences. Further research may also support their nutraceutical and therapeutic effects. The data obtained from research studies on Thracian TFs can contribute to the socioeconomic development of Turkey, as well as to the presentation of the local culture in the world and should therefore be recorded.

References

Akalin, A. S., Kinik, O., & Gonc, S. (1998). Research on the determination of fatty acid composition in cheese varieties sold in Izmir bazaar and market. *Gida*, *23*(5), 357–363.

Akalin, A. S., & Tokusoglu, O. (2010). Determination of conjugated linoleic acid (CLA, *c*9, *t*11 and *t*10, *c*12 18:2) and *a*-tocopherol in a dairy dessert hosmerim. *International Journal of Food Properties*, *13*, 105–111.

Akpinar-Beyazit, A., Ozcan, T., & Yilmaz-Ersan, L. (2009). Milk-based traditional Turkish desserts. *Mljekarstvo*, *59*(4), 349–355.

Altay, F., Karbancioglu-Guler, F., Daskaya-Dikmen, C., & Heperkan, D. (2013). A review on traditional Turkish fermented non-alcoholic beverages: Microbiota, fermentation process and quality characteristics. *International Journal of Food Microbiology*, *167*, 44–56.

Arici, M., & Coskun, F. (2001). Hardaliye: Fermented grape juice as a traditional Turkish beverage. *Food Microbiology*, *18*, 417–421.

Arici, M., & Daglioglu, O. (2007). *Boza: Laktik asit fermantasyonu ile uretilen tahil kaynakli geleneksel bir Turk gidasi, acisiyla tatlisiyla boza* (pp. 76–87). Ankara, Turkey: T.C. Kultur ve Turizm Bakanligi Yayinlari. (in Turkish).

Arrizon, J., Calderon, C., & Sandoval, G. (2006). Effect of different fermentation conditions on the kinetic parameters and production of volatile compounds during the elaboration of a prickly pear distilled beverage. *Journal of Industrial Microbiology Biotechnology*, *33*, 921–928.

Arslan, S., Durak, A. N., Erbas, M., Tanriverdi, E., & Gulcan, U. (2015). Determination of microbiological and chemical properties of probiotic boza and its consumer acceptability. *Journal of the American College of Nutrition*, *34*(1), 56–64. Available from https://doi.org/10.1080/07315724.2014.880661.

Atalay, H., & Erol, I. (1996). Investigation of vitamin B1 (Thiamin) and riboflavin (vitamin B2) content of various cheese types. *Turkish Journal of Veterinary Animal Science*, *20*(2), 89–95.

Aydin, C. (2003). Physical properties of almond nut and kernel. *Journal of Food Engineering*, *60*, 315–320.

Aydin, A., Aksu, H., Gunsen, U., Mercan, T., & Taskanal, N. (2008). Occurrence of aflatoxins in Turkish desserts: Cheese helva and hosmerim. *Archiv für Lebensmittelhygiene*, *59*, 16–19.

Balci Akova, S. (2012). Immigrations from the Balkans to Turkey and immigrant settlements in Western Anatolia. *IBAC*, *2*, 548–562.

Bilgicli, N., & Turker, S. (2004). The effects of yeast, malt flour and phytase additions on digestible protein and ash content of Tarhana. *Journal of S.U. Ziraat Fakultesi*, *18*(33), 90–97. Available from https://doi.org/10.1007/s13197-014-1598-x. (in Turkish).

Blandino, A., Al-Aseeri, M. E., Pandiella, S. S., Cantero, D., & Webb, C. (2003). Cereal-based fermented foods and beverages. *Food Research International*, *36*, 527–543.

Cabaroglu, T., & Yilmaztekin, M. (2011). Methanol and major volatile compounds of Turkish raki and effect of distillate source. *Journal of the Institute of Brewing*, *117*(1), 98–105.

Capanoglu, E., & Boyacioglu, D. (2008). Improving the quality and shelf life of Turkish almond paste. *Journal of Food Quality*, *31*, 429–445.

Cosansu, S. (2009). Determination of biogenic amines in a fermented beverage, boza. *Journal of Food, Agriculture & Environment*, *7*(2), 54–58.

Coskun, F. (2017). A traditional Turkish fermented non-alcoholic grape-based beverage, "Hardaliye". *Beverages*, *3*(2), 1–11.

Cunningham, S. (1999). Confectionery pastes from almonds. In *53rd PMCA production conference*. Princeton, NJ.

Daglioglu, O. (2000). Tarhana as a traditional Turkish fermented cereal food. Its recipe, production and composition. *Nahrung*, *44*, 85–88.

Dalgic, A. C., & Belibagli, K. B. (2008). Hazard analysis critical control points implementation in traditional foods: A case study of *tarhana* processing. *International Journal of Food Science & Technology*, *43*, 1352–1360.

Demir, H. (2005). *Peynir helvasi uretiminde recete gelistirilmesi uzerine arastırmalar* (M.Sc. thesis). Canakkale, Turkey: Natural Sciences Institute, Canakkale Onsekiz Mart University. (in Turkish).

Demirci, M. (1988). Trace element levels of our country are some cheese. *Gida*, *13*(1), 17–21.

Demirel, N., Doyuran, D. S., Gultekin, M., & Guven, S. (2005). Microbiological and chemical properties of cheese helva sold in Canakkale. In *Proceedings of 1st international food and nutrition congress* (p. 19). Istanbul, Turkey: The Scientific and Technological Research Council of Turkey Press.

Dissiz, M., & Oskay Yesiltepe, U. (2011). Evaluation of sexual functions in Turkish alcohol-dependent males. *Journal of Sex Medicine*, *8*, 3181–3187.

Durlu-Ozkaya, F., & Gun, I. (2014). Aroma compounds of some traditional Turkish cheeses and their importance for Turkish cuisine. *Food and Nutrition Sciences*, *5*, 425–434. Available from http://doi.org/10.4236/fns.2014.54050.

Erbas, M., Uslu, M. K., Erbas, M. O., & Certel, M. (2006). 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*, *19*, 294–301.

Erdogan, P. (2018). *Turk mutfak kulturunun sera gazi emisyonu ve su ayak izinin belirlenmesi* (M.sc. thesis). Turkey: Health Science Institute, Hacettepe University. (in Turkish).

Ergan-Goynusen, S. (2011). *The gastronomic culture in Edirne, effects to city's marketing and branding* (M.Sc. thesis). Turkey: Social Science Institute, Trakya University. (in Turkish).

Erickson, J., & Slavin, J. (2015). Total, added, and free sugars: Are restrictive guidelines science-based or achievable? *Nutrients*, *7*, 2866–2878. Available from https://doi.org/10.3390/nu7042866.

Evliya, B. A. (1990). Traditional Turkish fermented drink boza. In *Proceedings of the international conference on biotechnology and food science symposium*. Stuttgart, Germany.

Faid, M., Bakhy, K., Anchad, M., & Tantaoui-Elaraki, A. (1995). Almond paste: physicochemical and microbiological characterization and preservation with sorbic acid and cinnamon. *Journal Food Protection*, *58*, 547–550.

FAO. (2019). *Turkey and FAO: Partnering for food security and sustainable management of natural resources*. Retrieved from <http://www.fao.org/3/ax280e/AX280E.pdf>.
FAO & WHO. (2019). *Sustainable healthy diets – Guiding principles*. Rome, Italy. Retrieved from <http://www.fao.org/3/ca6640en/ca6640en.pdf>.
Fidan, I., & Anli, E. (2002). *Yuksek alkollu ickiler*. Ankara, Turkey: Kavaklidere Egitim Press. (in Turkish).
Fidan, I., Denli, Y., & Anlı, R. E. (1996). A research on the methanol content of *raki* produced in Turkey. *Gida*, *21*(6), 415–418. (in Turkish).
Fidan, I., & Sahin, I. (1993). *Alkol ve alkollü ickiler teknolojisi* (2nd Ed.). Ankara, Turkey: Ankara University Press. (in Turkish), Number 1295.
Grundy, M. M. L., Lapsley, K., & Ellis, P. R. (2016). A review of the impact of processing on nutrient bioaccessibility and digestion of almonds. *International Journal of Food Science and Technology*, *51*, 1937–1946.
Gulcu, M. (2010). Traditional grape products of Thracian region and local production form in Turkey. In *33rd World congress of vine and wine*. Tbilisi, Georgia.
Guneri, P., Cankaya, H., Yavuzer, A., Guneri, E. A., Erisen, L., Ozkul, D., … Boyacioglu, H. (2005). Primary oral cancer in a Turkish population sample: Association with sociodemographic features, smoking, alcohol, diet and dentition. *Oral Oncology*, *41*, 1005–1012.
Guven, K., & Benlikaya, N. (2005). Acid pH produced by lactic acid bacteria prevent the growth of *Baıllus cereus* in boza, a traditional fermented Turkish beverage. *Journal of Food Safety*, *25*, 98–108.
Hancioglu, O., & Karapinar, M. (1997). Microflora of boza, a traditional fermented Turkish beverage. *International Journal of Food Microbiology*, *35*, 271–274.
Hayaloglu, A. A., Guven, M., & Fox, P. F. (2002). Microbiological, biochemical and technological properties of Turkish White cheese 'Beyaz Peynir'. *International Dairy Journal*, *12*, 635–648.
Hayaloglu, A. A., Ozer, B. H., & Fox, P. F. (2008). Cheeses of Turkey: 2. Varieties ripened under brine. *Dairy Science Technology*, *88*(2), 225–244.
Ibanoglu, S., & Ainsworth, P. (2004). Effect of canning on the starch gelatinization and protein *in vitro* digestibility of *tarhana*, a wheat flour-based mixture. *Journal of Food Engineering*, *64*, 243–247.
Ibanoglu, S., & Ibanoglu, E. (1999). Rheological properties of cooked *tarhana*, a cereal-based soup. *Food Research International*, *32*, 29–33.
Jambazian, P. R., Haddad, E., Rajaram, S., Tanzman, J., & Sabate, J. (2005). Almonds in the diet simultaneously improve plasma alfa-tocopherol concentrations and reduce plasma lipids. *Journal of American Diet Association*, *105*, 449–454.
Jurado, J. M., Ballesteros, O., Alcazar, A., Pablos, F., Martin, M. J., Vilchez, J. L., & Navalon, A. (2007). Characterization of aniseed-flavoured spirit drinks by headspace solid-phase microextraction gas chromatography-mass spectrometry and chemometrics. *Talanta*, *72*, 506–511.
Kabak, B., & Dobson, A. D. W. (2011). An introduction to the traditional fermented foods and beverages of Turkey. *Critical Reviews in Food Science and Nutrition*, *51*, 248–260.
Kamber, U. (2007). The traditional cheeses of Turkey: Marmara region. *Food Reviews International*, *24*(1), 175–192. Available from https://doi.org/10.1080/87559120701764613.
Karakus, M., Borcakli, M., & Alperden, I. (1992). Beyaz peynirin olgunlasmasi surecinde laktik asit bakterileri. *Gida*, *17*, 363–369. (in Turkish).
Kornsteiner, M., Wagner, K. H., & Elmadfa, I. (2006). Tocopherols and total phenolics in 10 different nut types. *Food Chemistry*, *98*(2), 381–387.
Li, Z., Bhagavathula, A. S., Batavia, M., Clark, C., Abdulazeem, H. M., Rahmani, J., & Yin, F. (2020). The effect of almonds consumption on blood pressure: A systematic review and dose-response meta-analysis of randomized control trials. *Journal of King Saud University – Science*, *32*, 1757–1763.
Meric, A. (2010). *Some physicochemical and microbiological properties of boza produced in Thrace region* (M.Sc. thesis). Turkey: Namik Kemal University. (in Turkish).
Ozay, A., Akyol, A., & Azabagaoglu, M. O. (2005). The history and development of the Turkish wine industry. *International Journal of Wine Marketing*, *17*(2), 62–69.
Ozcan, T., & Ovali, B. B. (1997). A study on Lor cheese composition determination consumed in Bursa. *Turkish Journal of Veterinary Medical Association*, *68*(4), 63–65.
Ozdemir, S., Gocmen, D., & Kumral, A. Y. (2007). A traditional Turkish fermented cereal food: Tarhana. *Food Reviews International*, *23*, 107–121.

Ozkandan, S. (2009). *Determination of aroma compounds of different type of Turkish rakies by GC-MS-FID and effect of raw materials on the aromatic quality* (M.Sc. thesis). Turkey: Natural Science Institute, Cukurova University. (in Turkish).

Panagou, E. Z., Nychas, G. J. E., & Sofos, J. N. (2013). Types of traditional Greek foods and their safety. *Food Control*, *29*, 32–41.

Petrova, P. M., & Petrov, K. K. (2011). Antimicrobial activity of starch-degrading *lactobacillus* strains isolated from *boza*. *Biotechnology & Biotechnological Equipment*, *25*(1), 114–116. Available from https://doi.org/10.5504/BBEQ.2011.0124.

Prado, F. C., Parada, J. L., Pandey, A., & Soccol, C. R. (2008). Trends in non-dairy probiotic beverages. *Food Research International*, *41*, 111–123.

Republic of Turkey Ministry of Agriculture and Forestry. (n.d.). Retrieved September 1, 2019, from <www.arastirma.tarimorman.gov.tr>.

Republic of Turkey Ministry of Industry and Technology. (n.d.). Retrieved October 27, 2019, from <www.turkpatent.gov.tr>.

Salameh, C., Banon, S., Hosri, C., & Scher, J. (2016). An overview of recent studies on the main traditional fermented milks and white cheeses in the Mediterranean region. *Food Reviews International*, *32*(3), 256–279. Available from https://doi.org/10.1080/87559129.2015.1075210.

Tamer, C. E., Kumral, A., Asan, M., & Sahin, I. (2007). Chemical compositions of traditional *tarhana* having different formulations. *Journal of Food Process and Preservation*, *31*, 116–126.

Todorov, S. D., Botes, M., Guigas, C., Schillinger, U., Wiid, I., Wachsman, W. B., … Dicks, L. M. T. (2007). Boza, a natural source of probiotic lactic acid bacteria. *Journal of Applied Microbiology*, *104*, 465–477.

Trichopoulou, A., Soukara, S., & Vasilopoulou, E. (2007). Traditional foods: A science and society perspective. *Trends Food Science & Technology*, *18*, 420–427.

TUIK. (2018). Turkish Statistical Institute. Retrieved November 11, 2019, from TUIK database.

Turkish Food Codex. (2005). *Official statement of distilled alcoholic beverages*. Governmental Newspaper, No. 23172. Retrieved from <http://www.kkgm.gov.tr/TGK/Teblig/2005-11.html>.

Turkish Standards Institution. (1992). Boza TS 9778:1992. Retrieved from <https://en.tse.org.tr/>.

Ugurlu, K. (2015). The impacts of Balkan cuisine on the gastronomy of Thrace region of Turkey. In K. Csoban, & H. E. Konyves (Eds.), *Gastronomy and culture* (pp. 43–66). University of Debrecen Hungary.

Unsal, A. (1997). *When milk slept "Turkish Cheeses"* (pp. 49–81, 216–244). Istanbul, Turkey: Bank of Yapi Kredi Publications.

USDA. (2020). *Almond paste*. Retrieved from <https://fdc.nal.usda.gov/fdc-app.html#/food-details/784414/nutrients>.

Uylaser, V., Korukluoglu, M., Gocmen, D., & Sahin, I. (1998). *Bursa'da satisa sunulan bozalarin bilesimi ve kalitelerinin arastirilmasi* (pp. 337). Gaziantep, Turkey: Gida Muhendisligi Congress. (in Turkish).

Uysal, U. D., Oncu, E. M., Berikten, D., Yilmaz, N., Tuncel, N. B., Kivanc, M., & Tuncel, M. (2009). Time and temperature dependent microbiological and mycotoxin (ochratoxin-A) levels in *boza*. *International Journal of Food Microbiology*, *130*, 43–48.

Yasarlar, E. E. (2004). *A study on dietary fiber enrichment of Tekirdag meatball made of various cereal bran combinations* (M.Sc. thesis). Turkey: Natural Science Institute Trakya University. (in Turkish).

Yegin, S., & Uren, A. (2008). Biogenic amine content of *boza*: A traditional cereal-based, fermented Turkish beverage. *Food Chemistry*, *111*(4), 983–987.

Yilmaz, I. (1994). *Tekirdag koftesinin fiziksel, kimyasal ve mikrobiyolojik ozelliklerinin belirlenmesi uzerine bir arastirma* (M.Sc. thesis). Turkey: Natural Science Institute, Trakya University. (in Turkish).

Yilmaztekin, M., & Cabaroglu, T. (2011). Confirmatory method for the determination of volatile congeners and methanol in Turkish *raki* according to European Union Regulation (EEC) No. 2000R2870: Single-laboratory validation. *Journal of AOAC International*, *94*, 2.

Yucesoy, D. (2011). *Alkollu icecek raki'nin otantisitesinin ve bazi kalite parametrelerinin kızılötesi spekroskopi ile belirlenmesi* (M.Sc. thesis). Izmir, Turkey: Izmir Institute of Technology. (in Turkish).

Zat, E. (2011). *Raki ansiklopedisi* (pp. 453–565). Istanbul, Turkey: Overteam Publishing. (in Turkish).

Zorba, M., Hancioglu, O., Genc, M., Karapinar, M., & Ova, G. (2003). The use of starter cultures in the fermentation of *boza*, a traditional Turkish beverage. *Process Biochemistry*, *38*, 1405–1411.