# TRADITIONAL DAIRY PRODUCTS IN HATAY PROVINCE

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**Abstract**

*Dairy products have been very important components in the Turkish diet for centuries especially cheese which is a principle food and a tradition for breakfast. Traditional dairy products are becoming more popular in Turkey due to the turning back to the "natural alimentation". They are differing between regions in Turkey according to the geographical location, cultural differences and traditional customs and values. Many factors are influencing the consumption of traditional dairy products such as; migration of the people from rural to urban areas, nostalgia, renewal of the nutrition habits, agro-turism, interest on products of free from additives. Most of the traditional products is produced only in the rural areas and some of them are about to be forgotten. Lack of the interdisciplinary collaboration between farmer, producer and the consumer triangle, hygienic and sanitary conditions in the production and storage conditions constitute the main problems. In the Hatay province of Turkey is mainly processed into some traditional dairy products such as; Salted yoghurt, Carra cheese, Surk cheese, Künefe cheese, Sünme cheese, Hatay Dil cheese, Ezme cheese. The aims of this review were to introduce traditional dairy products produced in the Hatay province of Turkey and to characterize the processing stages and to describe their compositional characteristics.*

**Key words:** *traditional dairy products, manufacturing technology, yoghurt, cheeses*

## 1. INTRODUCTION

Traditional cheeses represent a cultural heritage and are the result of accumulated empirical knowledge passed from generation to generation (Alichanidis & Polychroniadou, 2008). The traditional dairy products, especially cheese, have an important place in rural-region food culture. Some of traditional cheese is produced only in the local areas and most of them is about to be forgotten depending on the changes of socio-economic levels of the producers (Yılmaz, Yılsay & Kurdal 2005). Mediterranean region of Turkey is quite rich from the point of the traditional dairy products produced by household since many years. The main characteristic of the Mediterranean area is the importance of sheep and goat milk production, mainly processed as cheeses although some cheeses are also made with cow or buffalo milks (Dubeuf, Morales & Genis 2010). Turkey, which has been the cradle of various civilizations over thousands of years, has geography very suitable for stock-breeding, and it offers a very rich choice of different cheeses. There are more than 110 types of cheeses traditionally produced in Turkey (Güler 2014) and many commercial varieties produced, such as Turkish White cheese (named as Beyaz Peynir originally), Kashar cheese (like Kashkaval or Kasseri cheeses), and Tulum cheese (ripened in goat skin bags or plastic material) (Colak et al. 2006). Although there are many traditional cheese varieties in Turkey, their production is largely based on small-scale dairies and family farms. However, due to the rapid industrialization modernized dairy processing firms have started to produce various kinds of traditional cheese. By this way cheeses that were only known by a specific region, are now known country-wide (Koyuncu & Tuncel 2005). In addition through combining traditional cheeses with modern technology, while still preserving their local characteristics, the rescue of large business enterprises from their focus on a single type of cheese making may be assisted (Kamber 2015).

## 2. TRADITIONAL DAIRY PRODUCTS IN HATAY PROVINCE

### *2.1. Salted Yoghurt*

Salted yoghurt is a traditional goat milk product produced in Antakya province (Antiocha) in the Mediterranean part of Turkey and known as "yogurt cheese" or "winter yogurt" due to the high dry matter content and long shelf life (Ocak & Karaca 2009). It is also produced in Syria and Lebanon which are the cultural neighbors of Turkey in terms of some foods. The salted yoghurt has unique properties such as salty and sour aroma. The unique production process of salted yogurt is concentration and conservation of yogurt by heating and addition of salt, respectively. These processes prolong its shelf life till a year (Hayaloglu & Karagul-Yuceer 2011). Besides, because of it's a concentrated product, level of the dry matter, fat, protein and mineral contents are relatively high. This product is produced in small dairy plants (Ocak & Karaca 2009). To avoid growth of fungi on its surface, salted yogurt is stored in a jar under olive oil. For its production, cow's, goat's or ewe's milk are used but, more white color and a smooth consistency can be achieved when it is produced by using goat's milk (Say & Sahan 2002; Sahan & Say 2004).

For this purpose, raw milk was subjected to a heat treatment at 95 ◦C for 20 min, and left for cooling to 40-45 ◦C. As starter culture, yoghurt, 1 day old, was added to the milk, which was then incubated for 4 h thereafter. After yoghurt gel forms, it was kept for one night at ambient temperature. Yoghurt was mainly 1 day old, and then it was drained to remove some whey using a cloth bag. Draining also helps to reduce the cooking time. Drained (strained) yoghurt was transferred to a steel container with a flat bottom under which a fire has been set. Yoghurt was stirred continuously until it boils. Continuous stirring is believed to be essential. The cooking stage was continued for some more time until the yoghurt thickens enough to start splashing, which takes about 60 min for 8 kg yoghurt depending on the fire. At this point, salt was added at the level of about 2% and stirring was carried out for another 5 min or so. When the cooking stage was completed, salted and cooked yoghurt was transferred to another container and left for cooling. After that, yoghurts were put into plastic container of 900 g and closed, and then stored in refrigerator at 4 $^{o}$C (Guler 2007). Salted yoghurt is mostly used to make soup and to consume in the breakfast by adding some species (red pepper, mint and olive oil) or as snack.

Guler & Avsar (1999) reported that total solid, protein, fat, salt, titratable aciditiy 24.3%, 9.4%, 9.0%, 4.3% and 2.2% la, respectively. Güler (2007) determined concentrations of 24 minerals including Ca, K, Mg, Na, P, S, Ag, Al, As, B, Ba, Cd, Co, Cu, Cr, Fe, Mn, Mo, Ni, Pb, Se, Si, Sr, Zn and chemical composition of salted yoghurt. Mean concentrations (ppm) for major minerals in salted yoghurt (2134 Ca, 1508 P, 838 Mg, 923 S, 554 K and 5147 Na and minor mineral (B>Si>Se>Ni>Zn>Al>Fe>Cu>Sr>Ba>Mo>Co>Pb>Cd>Mn>Ag>Cr) of salted yoghurt were found.

Güler & Park (2009) reported that the mean chemical compositions of salted yogurt were: total dry matter 31.9%; total fat 10.20%; ash 2.26%; pH 3.77. They stated total dry matter content of salted yogurt is about 3 times higher than regular yogurt because of cooking process in its production.

### *2.2. Carra Cheese*

Carra, which means "earthenware jug", is a traditional cheese containing mostly black cumin (*Nigella sativa*) and/or garden thyme (*Thymus vulgaris*) that is one of the most commonly consumed cheese in the Antakya (Antioch) region, located in the southern of Turkey. It is produced from mostly goat's or rarely cow's milk in small dairy plants or in farms and private houses. Its texture is semi-hard or hard and it is sold in blocks. A commercial culture is needed to be added into the warm milk (about 30-32 °C). Approximately after 1 h the curd will be formed and cut into small pieces. The whey is separated by using a cheese-cloth (cotton bag) and the pressing process need to be applied for 30 min. After the curd is sliced into 1 cm thick pieces, salt is putted between the slices and then left for 2-3 days for hardening. On the other hand, salt at a ratio of approximately 4% was added into skim milk cheese, which is produced from yogurt and called cokelek in Turkey. Then it is placed into a cotton bag and put under pressure to release its water.

Dried black cumin and/or wild thyme at a ratio of approximately 5% each are well mixed with the skim milk cheese until a homogenous structure is obtained. The curd and skim milk cheese are put into an earthenware jug layer by layer and a piece of cloth was placed on over it. The top of the jug is sealed with a mixture of wood ash, salt, olive oil and water and after this mixture has been dried it is covered tightly once again by a piece of cloth (Konar & Guler 1998; Karaca et al. 2007; Ocak & Karaca 2009). Then, the jug is buried under ground (about 1.5 m deep) to ripen for at least 4-5 months. The manufacturing protocol for Carra is not yet standardized and the production method may vary (Hayaloglu & Fox 2008).

The results of chemical analysis of 30 Carra Cheeses in Antakya markets were obtained total solid, fat, fat in dry matter, protein, salt, salt in dry matter, titratable acidity, pH, total nitrogen, water soluble nitrogen, non-protein nitrogen, proteose-pepton nitrogen and ripening level of Carra cheese were 53.43%, 24.86%, 46.65%, 18.86%, 8.83%, 16.73%, 0.85%, 5.63, 3.05%, 0.70%, 0.46%, 0.28% and 21.84%, respectively by Konar & Güler (1998).

Guler (1999) compared Carra cheeses which made from raw and pasteurizes cow's and goat's milk, ripened for 90 days traditionally in pottery "Chanaks" by burying in the ground and refrigerator and also in plastics containers in refrigerator. The best quality Carra cheese was obtained from pasteurized goat's milk and ripened for 3 months in the plastic containers, in the refrigerator. The mean values of the composition of these cheeses made from goat's milk were 52.43% total solids, 25.67% fat, 23.09 % protein, 6.35% salt and 48.33% ripening index. Water soluble nitrogen, non-protein nitrogen, proteose-pepton nitrogen and phosphotungustic acid-soluble nitrogen were 1.75%, 1.21%, 0.63%, 0.37%, respectively.

Aygun, Aslantas & Oner (2005) examinated the microbiological quality of 50 Carra cheese produced in the Antakya region and found total solid, fat, salt, pH of Carra cheese were 58.74%, 26.77%, 7.82% and 5.24 , respectively. They suggested that for improving the microbiological quality of Carra cheese, pasteurized milk should be used instead of raw milk and the processing; ripening and storage should be carried out under good hygienic conditions and the cheese should be stored continuously in refrigerated conditions after manufacturing until consuming.

### *2.3. Surk Cheese*

Surk is a traditional cheese of South Anatolia region, that is added spices in it and has a pear-like shape. Surk cheese may be produced from different sources, such as fresh cheese, buttermilk and whey. It is prepared from cokelek, a dairy product obtained by heating and coagulating acidified milk, some spices, (black cumin, black pepper, clove, thyme, red pepper, cumin, coriander, nutmeg, mahaleb, peppermint, cinnamon, pimento and ginger) garlic if desired and salt (Güler 1999; Karaca et al. 2007; Ocak & Karaca 2009). Surk cheese is produced by heating diluted nonfat yogurt and adding flavorings to the resultant acid-heat curd. Finally, shaped conically, can be stored aerobically for mold growth and anaerobically in olive oil at room temperature (Masatcıoglu & Avsar 2005).

Surk cheese is traditionally made from diluted yogurt (ayran) through boiling. The ayran, the liquid remaining after the manufacture of butter from yogurt, is boiled for ~30 min to precipitate milk proteins. The precipitate is pressed for 5–6 h to remove excess whey, and then added to various spices and herbs (peppermint, thyme, mint, cumin, black papper, cinnamon, and ginger) (at 0.1-0.3% each) and chili pepper (2-3%). After kneading with added salt (~5%), the mixture is made into a conical strawberry or pear-like shape, weighing 150-200 g and 5-7 cm in diameter. Therefore, Surk is a cheese containing various spices and herbs produced by acid/heat combination in the southern part of Turkey, particularly in Antakya (Antioch). Surk cheese is usually consumed fresh without aging after air-drying in a shaded enviroment for 3-4 days or wrapped in parchment paper (Hayaloglu & Farkye 2011).

Using natural food additives as an alternative to commonly used chemical preservative have become more important nowadays. Natural additives used in production of Surk, e.g. salt and spices, should be taken into consideration with this respect. A number of studies have been shown that those

spices/herbs (thyme, clove, allspice, black pepper, red pepper, garlic) have antimicrobial effects on a number of pathogens, particularly food-bornes (Masatcıoglu, Evrendilek & Avşar 2003). Nowadays, consumers demand a high quality of this product, which may benefit their health. Spices and herbs used for Surk cheese-making can play an important role in promoting human health due to their anticancer, antioxidative, and antiinflammatory properties. Spices have long been used in foods due to their flavouring and antimicrobial effects on bacteri, fungi, and virus, and the antioxidant functional properties, whereby Surk cheese has a good marketing potential due to the special added herbs and spices. Treatments with herb extracts increased the stability of cheese against lipid oxidation and also resulted in the antibacterial and antioxidant activity (Güler 2014).

Guler (1999), reported that total solids, fat, protein, salt and the ripening index, water soluble nitrogen, non-protein nitrogen, proteose-pepton nitrogen and phosphotungustic acid-soluble nitrogen of surk cheese were 39.57% 6.50%, 23.15%, 4.87% 47.62%, 1.72%, 1.08%, 0.63% and 0.75% respectively.

Total solid, fat, fat in dry matter, protein, salt, salt in dry matter, titratable acidity, pH, total nitrogen, water soluble nitrogen, non-protein nitrogen, proteose-pepton nitrogen, and phosphotungustic acid-soluble nitrogen and ripening index of 36 Sürk Cheeses in Antiocha markets obtained by Konar & Güler (1998), were 44.32%, 8.99%, 19.62%, 19.02%, 8.35%, 18.72%, 1.14%, 4.94, 2.98%, 1.58%, 0.48%, 1.69%, 0.28% and 52.91% respectively.

Aygun, Yaman & Durmaz (2007) stated that the Surk cheeses - traditional Turkish dairy products – are infested by *Tyrophagus putrescentiae.* Stejskal et al. (2015) reported that this reflects a general problem of the traditional style of food production that is hard to be in 100% compliance with the new hygienic standards in EU. Legislation should provide sufficient flexibility to be applicable in all situations, including in small businesses unless it negatively affects or slows production of traditional products.

Güler (2014) evaluated that the basic chemical composition, organic acids, volatile compound profiles, and overall acceptability of Surk cheese (acid cheese). A total of 134 volatile compounds, including 42 esters, 40 terpenes, 15 alcohos, 11 free fatty acids, 6 ketones, 5 aldehydes, 4 alkenes, 4 phenyl propanoids, 3 phenolics, and 4 other compounds, were identified in the Surk cheeses. The main compounds were found to be carvacrol, γ -terpinene, p-cymene, hexanoic acid, octanoic acid, decanoic acid, butanoic acid, and eugenol. The mean total organic acid content of the Surk cheese was 1.71 g/100 g. The main organic acid in the Surk cheese was lactic acid (1067 mg/100 g), followed by acetic, propionic, oxalic, formic, citric, pyruvic, orotic, hippuric, and uric acids.

### *2.4. Künefe Cheese*

This cheese does not constitute a special cheese variety, since it is similar to the commonly known White Cheese. However, in its production special care is taken to use milk containing a high level of fat. Another difference between this cheese and the common White Cheese is that, because of how it is used on a daily basis, it is made without the addition of salt and without being given a particular shape (Kamber & Terzi 2008). Künefe cheese is mostly made from goats', sometimes cows' milk or a mixture of both. While Künefe cheese is sold fresh as soft cheese for a special dessert (Künefe), Sünme cheese is usually consumed in the breakfast. Künefe cheese is consumed as a fresh and unsalted dessert cheese and has melting properties. This cheese is also the main component in many cheese varieties produced in the same region such as Yuvalama, Dil and Sünme cheeses. Above mentioned cheese types are produced by making some modifications on Künefe cheese (kneading, shaping, stretching etc.) (Karaca & Kırdar 2010). Composition of Künefe cheese, are determined by Karaca et al. 2008, are given in Table 1.

No starter culture in used in Künefe cheese. The raw milk of goat or cow is coagulated with commercial rennet at 35±2 °C for 60 min or longer. The curd is cut into 2-3 $cm^3$ pieces and some time after cutting (15-20 min), the curd need to be put into traditional cheese cloth (muslin) in steal or wood box for separating the whey by itself and tied four-sided of cloths and than covered box should be removed. After keeping for about 30 min to drain off the whey, the cheese cloth is tied very tightly for

30 min again. The pressing process need to be applied for 1-2 h by piled up one cloth on the top of the other. After whey separation, this raw cheese is cut into 4-6 big pieces. Cheeses are left fermentation either at room temperature 6 h in summer about, 12 h in winter or 24 h at +4 °C in refrigerator until the cheese curd reach to around 4.9-5.3 pH. The end of the fermentation is determined by the producers with stretching test in hot water.

| Properties | Künefe Cheese |
|---|---|
| Titratable Acidity (LA%) | 0.63 |
| pH | 5.36 |
| Dry Matter (%) | 46.43 |
| Protein (%) | 19.47 |
| Protein in Dry Matter (%) | 42.15 |
| Fat (%) | 24.19 |
| Fat in Dry Matter (%) | 52.07 |
| Salt (%) | 0.24 |
| Salt in Dry Matter (%) | 0.53 |
| Ash (%) | 1.88 |

**Table 1.** Composition of Künefe Cheese (Karaca et al. 2008)

*2.5. Sünme Cheese*

Sünme cheese is a semi-hard cheese variety, has a fibered structure and consumed for breakfast. Originally, Sünme cheeses are made from goat's milk; it is now also derived from cow's milk. After production of Künefe cheese, Sünme cheese can be obtained by making some application stages, stretching, shaping into traditional forms and salting in brine. These stages is similar to Pasta filata cheeses, having a unique plasticizing and kneading treatment of the fresh curd in hot water, which gives the product a fibrous structure and melting and stretching properties. It is being made totally by the hand of man. Composition of Sünme cheese, are determined by some researchers, are given in Table 2. The average nitrogen fraction results were obtained as the follows; total nitrogen 4.09%, water soluble nitrogen 0.66%, casein nitrogen 3.44% and ripening index 16.60% by Karaca & Güven (2004).

**Künefe cheese**
Slicing
Immersing in hot water (80-85 °C 1-2 min)
Kneading
Stretching
Shaping
Salting (in brine 14-16 %)

**Figure 1.** Sünme (Mutlu 2000) and Dil (Karaca et al. 2009a) cheeses production

The Künefe curd is cut into slabs that are kneaded and stretched in hot water (80-85 °C 1-2 min). Squeezing is applied the curd within two hands, excessive water is removed and given a ring-shaped for making longer or stretching stage. The hot curd is kneaded and than stretched (sometimes 2 meters long) by hand until it becomes shiny, smooth and elastic. The stretching process is repeated until the curd has a fibrous character. The stretched curd is given into string shapes by folding up and than tied a knot to top of the cheese. The shaped curd is then chilled in cold water to harden, and salted for several days in cool brine (Figure 1). Frequently, after brining, the cheese is packaged with a vacuum plastic or can be stored in freezer. Its yield is about 10% (Karaca & Kırdar 2010).

| Properties | Biçer et al.,1995 | Mutlu, 2000 (n: 20) | Karaca&Güven, 2004 (n:30) |
|---|---|---|---|
| Titratable Acidity (LA%) | 2.0 | 0.27 | 1.41 |
| pH | - | 5.05 | 5.60 |
| Dry Matter (%) | 63.1 | 54.09 | 53.74 |
| Protein (%) | 21.4 | 24.38 | 26.12 |
| Protein in Dry Matter (%) | - | - | 48.51 |
| Fat (%) | 31.7 | 21.45 | 20.07 |
| Fat in Dry Matter (%) | - | 39.66 | 37.20 |
| Salt (%) | 9.3 | 6.59 | 2.65 |
| Salt in Dry Matter (%) | - | 12.30 | 4.98 |
| Ash (%) | 1.9 | - | 8.54 |

**Table 2.** Composition of Sünme Cheese

*2.6. Hatay Dil (String) Cheese*

Dil cheese is a pasta filata type cheese with a characteristic fibrous texture produced in Turkey. After renneting, the curd is cut, cooked, drained and cheddared until a pH in the range of 5.1-5.3 is reached. Blocks of curd obtained by cheddaring are placed into a twin-screw mixer containing water or brine at about 80 °C and kneaded and stretched to provide longitudinal fibers. Elastic curd is extended manually into a long mould, cooled with cold water and cut into strings. Strings of cheese could be salted in brine according to the manufacturing procedure. Several cheese strings are packaged in plastic packages under vacuum and stored at 4 °C for 3-4 months (Kılıc & Isın 2004; Karaca & Kırdar 2010)**.** Composition of Dil cheese, are determined by Karaca et al. (2009a), are given in Table 3.

| Properties | Hatay Dil Cheese |
|---|---|
| Titratable Acidity (LA%) | 1.155 |
| pH | 5.62 |
| Dry Matter (%) | 48.55 |
| Protein (%) | 20.12 |
| Protein in Dry Matter (%) | 41.45 |
| Fat (%) | 19.80 |
| Fat in Dry Matter (%) | 40.73 |
| Salt (%) | 5.38 |
| Salt in Dry Matter (%) | 11.14 |
| Ash (%) | 6.66 |
| Ripening Indice (%) | 11.64 |

**Table 3.** Composition of Hatay Dil (String) Cheese (Karaca et al. 2009a) (n:26)

*2.7. Hatay Ezme (Press or Leaf) Cheese*

Ezme (Press or Leaf) cheese is a local cheese made from cow's milk. Ezme Cheese is found as thin slices (0.5-1centimeters thick), either square, rectangular (4–6 cm.) or round (with a diameter of approximately 10-15 centimeters). This cheese is white, of soft consistency and low maturity. Cow's milk is drawn, strained, boiled (at 65°C for 35 min) and then cooled approximately to 35°C. It is fermented with commercial rennet in a ratio of "1-2 ml of rennet to each 20 kg milk." It is then left for about an hour for curd to form. The curd obtained is later stretched thin inside a cloth and is put under pressure by placing a weight on top. It remains under pressure for the duration of a night and takes the shape of a thin mould, after which it is cut into pieces measuring 1x4x4 centimeters and may be salted and offered fresh for consumption. However most of the time, the cheese is salted and preserved in jars. This cheese is widely consumed in the region at breakfast and as a fried dish. It is softened by

heating in water for a minute or two immediately prior to consumption (Kamber 2008; Karaca & Kırdar 2010). Composition of Hatay Ezme cheese, are determined by Karaca et al. (2009b), are given in Table 4.

| Properties | Hatay Ezme Cheese |
|---|---|
| Titratable Acidity (LA%) | 0.653 |
| pH | 6.25 |
| Dry Matter (%) | 49.23 |
| Protein (%) | 19.48 |
| Protein in Dry Matter (%) | 39.60 |
| Fat (%) | 23.00 |
| Fat in Dry Matter (%) | 46.67 |
| Salt (%) | 3.96 |
| Salt in Dry Matter (%) | 8.04 |
| Ash (%) | 5.58 |
| Ripening Indice (%) | 8.85 |

**Table 4.** Composition of Hatay Ezme Cheese (Karaca et al. 2009b) (n:30)

## 3. CONCLUSION AND RECOMMENDATIONS

A large number of traditional dairy products in Turkey are produced but only a few are made on by an industrial scale. Traditional production conditions in the rural regions in Turkey need some improvement from the hygienic and sanitary point of the view. Dairy products could play an important role in the rural development of the Hatay province of Turkey if it could be transformed into good-quality cheeses with high sanitary conditions. More studies are needed to improve the existing technology with a view to obtaining cheeses of uniform quality while keeping the original characteristics. Better knowledge of their manufacturing procedures, biochemical and microbiological characteristics would favor the improvement of the manufacturing technology and help to obtain constant quality products capable of being successfully introduced into national and international markets. Finally, it can be concluded that modern technologies and facilities must be used instead of traditional processing methods under primitive conditions for production of cheeses. More efforts are needed to improve the present technology and obtain cheeses with a uniform quality while keeping its original characteristics.

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