Scientific Papers. Series D. Animal Science. Vol. LIX, 2016
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

DAIRY GOAT PRODUCTS OF EAST MEDITERRANEAN REGION OF TURKEY: KÜNEFE AND SÜNME CHEESES

Oya Berkay KARACA[1], Sezen OCAK[2]

[1]Cukurova Uni, Karatas School of Tourism and Hotel Management, 0190, Adana, Turkey
[2]NiğdeUniversity, Faculty of Agricultural Sciences and Technologies, Dep. of Animal Production & Technologies, 51240 Nigde, Turkey

Corresponding author email: sezenocak1@gmail.com

Abstract

Goat products have historically been used for multitude of purposes; forming an integral component of the livestock industry, plays a vital role in the socio economic structure of the rural community. Turkey has the highest goat population in Europe with 8 million head however; the population has a decreasing trend due to poor performance of native breeds, lack of state support policies and migration from the rural to urban areas by 40% from 13.3 million down to 8 million between the years of 1985 and 2014. Dairy goat products and cheeses constitute of a long historical back ground in Turkey, as well as many toher Mediterranean countries. Künefe and Sünme cheeses are traditional dairy goat products that are produced in the Eastern Mediterranean region of Turkey with local artisan cheese-making procedures. They are mostly made from goats', sometimes cows' milk or a mixture of both. With the high industrialisation like in many fields, artisanal cheese types are diminishing. While Künefe cheese is sold fresh as soft cheese for a special dessert (Künefe), Sünme cheese is usually consumed in the breakfast. The objectives of the present paper were to characterize the processing stages of Künefe and Sünme cheeses produced from goats' milk and to describe their compositional characteristics. A better knowledge of their characteristics would support the improvement of the production technology and help to obtain a constant quality product capable of being successfully introduced into national and international markets. Apart from the present situation, production methods and steps affecting consumption of above mentioned cheese types are elaborated in this paper. Information gathered from this study may provide a better understanding of Künefe and Sünme cheese and therefore could be useful to disseminate artisanal cheese types in the industry.

Key words: *Goat cheese, Künefe, Sünme, traditional dairy products, production technology.*

INTRODUCTION

Goat milk production is a dynamic and growing industry that is fundamental to the well being of millions of people worldwide and is an important part of the economy in many countries (Thum et al., 2015). It has been used throughout the world since ancient times for the manufacture of different types of cheeses (Park, 2001; Mehaia, 2002). Goat cheese demand is also rising quite considerably, especially among gourmets and consumers of health and diet products due to its high nutritional value in terms of proteins and fat (Fresno et al, 1997; Caponio et al, 2000; 2001). Mediterranean countries are important producers of goat milk and most of it is used for cheese production (Juan et al., 2016). Goat milk differs from cow milk from its higher digestibility, alkalinity, buffering capacity, and certain nutritional and therapeutic properties (Park, 1994). These nutritional features have contributed to the growth of the market for goat dairy products, and consequently have attracted the interest (Golinelli et al., 2014). Goat milk presents some specificities related to its chemical properties, specially due to the characteristics of its proteins, which display reduced levels, or even a lack of, α_{s1}-casein, as well as structural differences in α-lactalbumin and beta (β) lactalbumin. These characteristics make it less allergenic when compared to bovine milk. Therefore, cheeses prepared using goat milk present a number of desirable properties to many consumers, especially those who are allergic to the type of protein present in bovine milk (Bezerra et al., 2016). Goat milk exceeds cow milk in monounsaturated (MUFA), polyunsaturated fatty acids (PUFA), and medium chain triglycerides (MCT), which all are known to be beneficial for human health, especially for cardiovascular conditions. This

biomedical superiority has not been promoted much in marketing goat milk, goat yoghurt and goat cheeses, but has great potential in justifying the uniqueness of goat milk in human nutrition and medicine for treating the various gastro-intestinal disorders and diseases, besides its value in alleviating cow milk allergies (Haenlein, 2004).

Goat breeding is a common activity in the Mediterranean region of Turkey as a result of their good adaptability to the harsh environmental conditions and their converting ability of low input to high valuable products. Most of the milk is processed by household to cheese and sold in the nearby region since many years. Traditional dairy goat products are usually manufactured by the small scale producers and consumed locally. With the increased industrialization in the recent years some of the traditionally produced cheese types have begun to disappear. A large number of goat cheeses are produced at the industrial scale but only a few are still remains as traditional and supports the rural area's income. It is important to keep traditional types both as a cultural heritage and for supporting the rural income.

One of the important cheese type in the Eastern Mediterranean Region of Turkey is Sünme and Künefe cheese. These types are not produced under industrial scale and are region specific. We aim to introduce these special types of cheeses with a wide description of their processing steps as well as the properties of goat milk and its benefits for human health.

COMPOSITION/NUTRITIONAL VALUE OF GOAT MILK

The popularity of dairy products made from milk of small ruminants is increasing among researchers and the dairy industry, due to their peculiar taste and nutritional proprieties (Niro et al., 2014). Compositions of goat, sheep, cow and human milks are different (Table 1), but vary with diet, breed, individuals, parity, season, feeding, management, environmental conditions, locality, stage of lactation, and health status of the udder (Park et al., 2007).

Cow milk and goat milk both have similar protein content, but goat milk proteins are assimilated more easily (Witczak et al., 2016). The principal caseins in goat milk are about the same as in the milk of sheep or cows, α_{s1}-casein, α_{s2}-casein, β-casein and κ-caseins (Park et al., 2007). It is poor in casein; casein micelles contain more calcium, in organic phosphorus, and non-centrifugal caseins, they are less solvated, less heat stable, and lose β-CN more quickly than cow milk casein micelles (Niro et al., 2014). Sheep and goat milk proteins are also important sources of bioactive angiotensin converting enzyme (ACE) inhibitory peptides and antihypertensive peptides. They can provide a non-immune disease defence and control of microbial infections. Important minor milk proteins include immunoglobulins, lactoferrin, transferrin, ferritin, proteose peptone, calmodulin (calcium binding protein), prolactin, and folate-binding protein. Non-protein nitrogen (NPN) contents of goat and human milks are higher than in cow milk. Taurine in goat and sheep milk derived from sulphur-containing amino acids has important metabolic functions as does carnitine, which is a valuable nutrient for the human neonate. Goat milk contains higher concentrations of nucleotides, polyamines and some of the essential amino acids (Thum et al., 2015). Goat milk with the genetic trait of low or no α_{s1}-casein, but instead with α_{s2}-casein, has less curd yield, longer rennet coagulation time, more heat lability, and weaker curd firmness, which also may explain the benefits in digestibility in the human digestive tract (Haenlein, 2004).

Triacylglycerols (TAG) constitute the biggest part of milk lipids (nearly 98%), including a large number of esterified fatty acids (Park et al., 2007). Nevertheless, the main characteristic of small ruminant milk fat is the high content in short- and medium-chain fatty acids (MCFA), especially in goat milk fat, which has at least twice as many C6–C10 fatty acids as cow milk fat: 8%, 12% and 16% total fatty acid for cow, ewe and goat milk fat, respectively (Raynal-Ljutovac et al., 2008). Sheep and goat milk also have simple lipids (diacylglycerols, monoacylglycerols, cholesterol esters), complex lipids (phospholipids), and liposoluble compounds (sterols, cholesterol esters, hydrocarbons). The average fat globule size is smallest (<3.5μm) in sheep milk followed by goat and cow milk. Five fatty acids (C10:0,

C14:0, C16:0, C18:0, and C18:1) account for >75% of total fatty acids in goat and sheep milk (Park et al., 2007). Average goat milk fat differs in contents of its fatty acids significantly from average cow milk fat (Jenness, 1980), being much higher in butyric (C4:0), caproic (C6:0), caprylic (C8:0), capric (C10:0), lauric (C12:0), myristic (C14:0), palmitic (C16:0), linoleic (C18:2), but lower in stearic (C18:0), and oleic acid (C18:1) (Haenlein, 2004).

Milk sugar, lactose, is the major carbohydrate in goat, sheep and cow milk. Lactose is a valuable nutrient, because it favors intestinal absorption of calcium, magnesium and phosphorus, and the utilization of Vitamin D (Park et al., 2007). Goat milk has higher digestibility and contains less lactose. Therefore, it can be recommended for those who suffer from lactose intolerance. In addition, it has a lower casein content (and is hence considered a hypoallergenic milk), and a similar oligosaccharide content to human breast milk (Vieitez et al., 2016).

Overall, goat milk has more Ca, P, K, Mg and Cl, and less Na and S contents than cow milk. Trace mineral contents of goat milk are also affected by diet, breed, individual animal, and stages of lactation, mean levels of Mn, Cu, Fe, and Zn in goat milk were 0.032, 0.05, 0.07, 0.56 mg/100 g respectively. Levels of folate and Vitamin B12 in cow milk are five times higher than those of goat milk, and folate is necessary for the synthesis of hemoglobin. Vitamin B12 deficiency can cause a megaloblastic anemia in infants, but the anemia has been attributed mainly to folate deficiency in goat milk (Park et al., 2007).

Table 1. Average Composition of Basic Nutrients in Goat, Sheep, Cow and Human Milk (Park et al., 2007)

Composition	Goat	Sheep	Cow	Human
Fat (%)	3.8	7.9	3.6	4.0
Solids-not-fat (%)	8.9	12.0	9.0	8.9
Lactose (%)	4.1	4.9	4.7	6.9
Protein (%)	3.4	6.2	3.2	1.2
Casein (%)	2.4	4.2	2.6	0.4
Albumin, globulin (%)	0.6	1.0	0.6	0.7
Non-protein N (%)	0.4	0.8	0.2	0.5
Ash (%)	0.8	0.9	0.7	0.3
Calories/100 ml	70	105	69	68

GOAT MILK PRODUCTION IN THE WORLD AND TURKEY

Goat milk and products of goat milk are important in human nutrition and have become a part of the current trend of healthy eating around the world. Goat milk consumption is increasing and consequently, the goat population has considerably increased during recent years (Sosnowski et al., 2016). At present, the global production of goat milk is estimated at 2025 million L. In the world the largest producers of goat milk are the USA (100 million L), Canada (60 million L), and Mexico (50 million L). Goat milk production in European countries accounts for 26% of world production (Witczak et al., 2016).

Turkey is among the 10 largest milk producers in the world (FAO 2014). The production of raw milk is mainly from cows and accounts for an average of 91-92 % of the total production dairy products have an important role in the Turkish diet.

Consumption level of liquid milk is very low; the most common form of milk consumption is yoghurt, followed by white cheese (feta type) and ayran, a liquid salted milk drink (Bor, 2014).

As it is seen from Table 2, the number of cattle is important for the milk production. There is a stable increase in the number of dairy goats, cattle and sheep since 2011. Animals that are milking shows an increasing trend with the years according to the TUİK (2014) and number of dairy goats are 3.9 million in 2014. Milk yield from the dairy goats are estimated as 415.000 tons.

Table 2. Total Numbers of Milking Animals (Millions) in Turkey (TUİK, 2014; USK, 2014)

Yıl	Goat	Cow	Sheep
2011	3.033.111	4.761.142	11.561.144
2012	3.502.272	5.431.400	13.068.428
2013	3.943.318	5.607.272	14.287.237

Table 3 shows milk production indices of sheep, goat and cattle in Turkey and in the World between 2006-2013.

The highest increase is has been observed in goat milk. Total global milk production is comprised of 2.4% goat and 1.3% sheep milk. World goat milk production is dispersed between Asia, Africa and Europa at 60%, 22% and 15%, respectively.

While sheep milk is utilised in Asia and Europa at 46% and 32%, respectively. Annual per head production of milk in 1930 was 80L, whilst in 2013 this figure grew to 105 L (USK, 2014).

Table 3. Total Milk Productions in The World and Turkey (tonnes) (FAOSTAT, 2016)

Milk Production	2006		2013		Change (%)	
	World	Turkey	World	Turkey	World	Turkey
Goat	15259583.00	253759.00	17957372.00	415743.00	+18	+64
Cow	563402301.00	10867302.00	635575895.00	16655009.00	+13	+53
Sheep	9338076.00	794681.00	10137749.00	1101013.00	+9	+39

Total cheese production in Turkey in 2013 was 600.266 tons, which consisted of 95.6% cattle milk and the rest was from sheep, goat and buffalo milk (USK, 2014).

GOAT CHEESES

The chemical characteristics of goat milk can be used to manufacture a wide variety of products, including fluid beverage products (low fat, fortified, or flavored) and UHT (ultrahigh temperature) milk, fermented products such as cheese, buttermilk or yogurt, frozen products such as ice cream or frozen yogurt, butter, condensed/dried products, sweets and candies (Ribeiro and Ribeiro, 2010). Goat cheese was originated in Mesopotamia and the milk was probably made into soft cheese, hard and ripened goat cheeses were later developed in the Mediterranean basin countries (Park, 2001). A considerable number of goat milk products have a strong regional and artisanal character (Sosnowski et al., 2016). Cheeses made from goat's milk are greatly appreciated because of their particular organoleptic characteristics. The composition of the lipid fraction plays an essential role in the sensory attributes of these products. The fatty acids hexanoic (caproic), octanoic (caprilic) and decanoic (capric), together with certain branched-chain free fatty acids, are responsible for the characteristic 'goaty flavour' of goat cheeses (Galiou et al., 2015).

The main characteristic of the Mediterranean area is the importance of sheep and goat milk production, mainly processed as cheeses. The small-scale and farm-made cheeses, mostly with sheep or goat milk, are generally considered a possible vehicle of economic and social development for the less favored rural areas; mountainous areas are seen as holders of local know-how (Dubeuf et al., 2010). Cheeses (Erzincan Tulum cheese, Izmir Brined Tulum cheese, Cimi Tulum cheese, Carra cheese, Kopanisti whey cheese, Sepet cheese), fermented dairy foods (Kefir, Salted yoghurt, Ayran), butter, ice cream (Kahramanmaraş ice cream) and milk based desserts made by using goat milk have very desirable sensory characteristics for the consumers in Turkey (Hayaloglu and Karagul-Yuceer, 2011). In the Mediterranean region, the other traditional goat cheeses (Antep Cheese, Çepni Cheese, Çimi Cheese, EğridirKelle Cheese, GönenYörük Cheese, Kartal Cheese, Kelle Cheese Koponesti Cheese, Sütlü Cheese (Toros), Teleme Cheese, Urfa White Cheese, Yayladağ Goat's Cheese and Denizli White Goat's Cheese) are also common produced (Kamber, 2015). In this study, we aim to describe Künefe and Sünme cheeses from the Eastern Mediterranean Region of Turkey.

KÜNEFE CHEESE

Künefe cheese is consumed as a fresh and unsalted dessert cheese and has melting properties (Table 4). At the same time, Künefe is a special dessert name in this region, making by Tel Kadayıf (a sweet pastry with a texture similar to that of shredded wheat. Shredded dough baked in syrup topped with crushed nuts, a kind of sweet pastry). It is used for production of some special desserts especially Semolina halva and Künefe. This cheese is also the main component in many cheese varieties produced in the same region such as Yuvalama, Dil and Sünme cheeses and Künefe cheese is manufactured before Sünme cheese production. Above mentioned cheese types are produced by making some modifications on Künefe cheese (kneading, shaping, stretching etc.).

Figure 1. Künefe cheese

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 sometime 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 then 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.

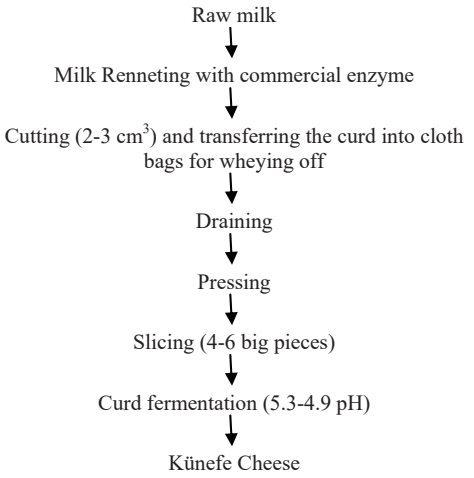

Figure 2. Production of Künefe cheese

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 then stretched (sometimes 2 meter 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 then 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. Frequently, after brining, the cheese is packaged with a vacuum plastic or can be stored in freezer. Its yield is about 10%.

Table 4. Composition of Künefe Cheese (Karaca et al., 2008)

Properties	Künefe Cheese
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

SÜNME CHEESE

Sünme cheese is a semi-hard cheese variety, has a fibered structure and it is 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 are 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.

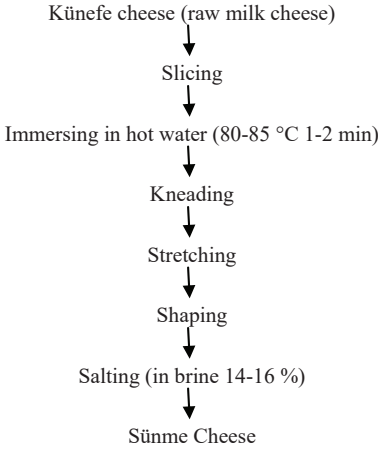

Figure 3. Traditional Sünme cheese production method (Mutlu, 2000)

Table 5. Composition of Sünme Cheese

Properties	Biçer et al., 1995	Mutlu, 2000 (n:20)	Karaca and Güven, 2004 (n:30)
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

Composition of Sünme cheese, determined by some researchers is given in Table 5. In addition to 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).

Physical, chemical and organoleptic properties of Sünme cheeses made from raw and pasteurized cows' milk, the two different brine including 14 %, 16 % ratio salt were investigated by Mutluer (2007) and ripened during 90 day.

From the results, it was found that using of brine including different levels of salt significantly had effect on pH value, titratable acidity, total solids, fat, fat in the dry matter, protein, protein in the dry matter, salt, salt in the dry matter, melting, total nitrogen, water soluble nitrogen, 12% trichloroacetic acid-soluble nitrogen, 5% phosphotungstic acid-soluble nitrogen, casein nitrogen, protease-peptone nitrogen values and water-soluble nitrogen, 12% trichloroacetic acid-soluble nitrogen, 5% phosphotungstic acid-soluble nitrogen, casein nitrogen, protease-peptone nitrogen in the total nitrogen ($p<0.05$) and organoleptic properties significantly had effected ($p<0.05$). It was determined that produced from raw milk and matured cheese in brine 16% was most preferred by panelists and Sünme cheese could be produced from heat-treated milk but these cheeses should be ripened up to 45 days to eliminate the negative impacts arising from the rapid maturation during storage or raising the percentage of salt in brine or packaging under vacuum.

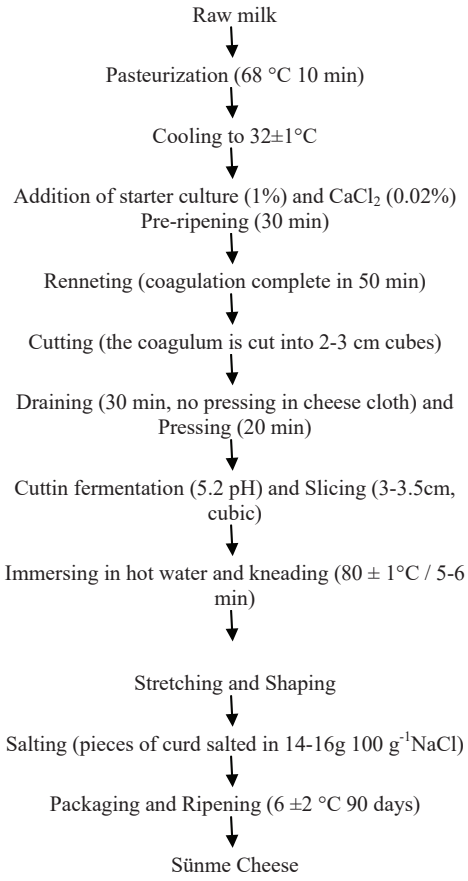

Figure 4. Standardized Sünme cheese production method (Mutluer, 2007; Mutluer et al., 2014)

Figure 5. Sünme cheese

CONCLUSIONS

There is quite limited information available about Sünme and Künefe cheeses in the literature. Since Künefe and Sünme cheeses production mainly take place on a non-industrial scale, quality is not consistent and the cheeses are not appropriately promoted or appreciated. However this traditional product is recently started to be produced in modern plants, however, it is not enough well known in Turkey as well as in the other countries. In addition, it can be concluded that modern technologies and facilities could be used instead of traditional processing methods for production of Künefe and Sünme cheeses in order to disseminate it worldwide.

REFERENCES

Bezerra T.K.A., Araujo A.R.R., Nascimento E.S., Paz J.E.M., Gadelha C.A., Gadelha T.S., Pacheco M.T.B., Queiroga R.C.R.E., Oliveira M.E.G., Madruga M.S. 2016. Proteolysis in goat ‘‘coalho” cheese supplemented with probiotic lactic acid bacteria. Food Chemistry, 196: 359-366.

Biçer O., Güler M. B., Keskin M., Kaya Ş., 1995. Goat production and some traditional goats milk products with special reference to Hatay Region of Turkey. International Dairy Federation, Production and Utilization of Ewes and Goats Milk.19-21 October 1995, Crete, Greece.72 p.

Bor Ö., 2014. Economics of dairy farming in Turkey. International Journal of Food and Agricultural Economics, 2 (4): 49-62.

Caponio F., Pasqualone A., Gomes T., 2001. Apulian Cacioricotta goat’s cheese: technical interventions for improving yield and organoleptic characteristics. European Food Research and Technology, 213 (3):178-182.

Caponio F., Gomes T., Alloggio V., Pasqualone A., 2000. An effort to improve the organoleptic properties of a soft cheese from rustic goat milk.European Food Research Technology, 211: 305-309.

Caroprese M., Ciliberti M.G., Santillo A., Marino R., Sevi A., Albenzio M., 2016. Immune response, productivity and quality of milk from grazing goats as affected by dietary polyunsaturated fatty acid supplementation. Research in Veterinary Science, 105: 229-235.

Dubeuf J.P., Morales F.A.R., Genis J.M.C., 2010. Initiatives and projects to promote the Mediterranean local cheeses and their relations to the development of livestock systems and activities. Small Ruminant Research, 93: 67-75.

FAOSTAT, 2016. Food and Agriculture Organization of the United Nations Statistics Division.http://faostat3.fao.org/

Fresno J.M., Tornadijo M.E., Carballo J., Bernardo A., Gonzalez-Prieto J., 1997. Proteolytic and lipolytic changes during the ripening of a Spanish craft goat cheese (Armada variety). Journal of the Science of Food and Agriculture, 75: 148-154.

Galioua O.E., Zantarb S., Bakkalia M., Laglaouia A., Centenoc J.A., Carballoc J. 2015. Chemical and microbiological characteristics of traditional homemadefresh goat cheeses from Northern Morocco. Small Ruminant Research, 129: 108-113.

Golinelli L.P., Carvalho A.C., Casaes R. S., Lopes C.S.C., Deliza R., Paschoalin V.M.F., Silva J.T., 2014. Sensory analysis and species-specific PCR detect bovine milk adulteration of *frescal* (fresh) goat cheese. Journal of Dairy Science, 97: 6693-6699.

Haenlein G.F.W., 2004. Goat milk in human nutrition. Small Ruminant Research, 51: 155-163.

Hayaloglu A.A., Karagul-Yuceer Y., 2011. Utilization and characterization of small ruminants’ milk and milk products in Turkey: current status and new perspectives. Small Ruminant Research, 101: 73-83.

Juan B., Zamora A., Quevedo J.M., Trujillo A.J., 2016. Proteolysis of cheese made from goat milk treated by ultra high pressure homogenisation. LWT-Food Science and Technology, 69: 17-23.

Kamber U., 2015.Traditional Turkey cheeses and their classification. Van Veterinary Journal, 26 (3):161-171.

Karaca O.B., veGüven M., 2004. Chemical and Organoleptical Properties and made of

HataySünme Cheese, Traditional Food Symposium, 23-24 Eylül 2004, Van.
Karaca O.B., Güven M., Mutluer U., Saydam İ.B., 2008. Hatay Künefepeynirininyapılışıveözellikleri. 10. Gıda Kongresi, 21-23 Mayıs 2008, Erzurum.
Mehaia M.A., 2002. Manufacture of fresh soft white cheese (Doiati-type) from ultrafilteredgoats's milk. Food Chemistry, 79: 445-452.
Meira Q.G.S., Magnani M., Júnior F.C.M., Queiroga R.C.R.E., Madruga M.S., GullónB., Gomes A.M.P., Pintado M.M.E., Souza E.L., 2015. Effects of added Lactobacillus acidophilus and *Bifidobacterium lactis* probiotics on the quality characteristics of goat ricotta and their survival under simulated gastrointestinal conditions. Food Research International, 76: 828-838.
Mutlu G., 2000. The chemical composition of Sünme cheese in Hatay Region of Turkey.Food 2000.Blacksea and Central Asaian Symposium on Food Technology, October 12-16, 2000, Ankara, Turkey.
Mutluer U., 2007. Uygulananbazifarkliişlemlerin sünmepeynirininözellikleriüzerineetkisi. Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Gıda Mühendisliği Anabilim Dalı, Yüksek Lisans Tezi, Adana, 64s.
Mutluer M., Güven M., Karaca O.B., Saydam İ.B., 2014. Farklıoranlardatuziçerensalamuralardade polanançiğveısılişlemuygulanmışsüttenüretilensün mepeynirlerininfiziksel, kimyasalveduyusalözel likleri. 4. Geleneksel Gıdalar Sempozyumu, Çukurova Üniversitesi, 17-19 Nisan 2014, Adana. S: 750-754.
Niro S., Fratianni A., Tremonte P., Sorrentino E., Tipaldi L., Panfili G., Coppola R. 2014. Innovative Caciocavallo cheeses made from a mixture of cow milk with ewe or goat milk. Journal of Dairy Science, 97: 1296-1304.
Park Y.W., 1994. Hypo-allergenic and therapeutic significance of goat milk. Small Ruminant Research, 14: 151-161.
Park Y. W., 2001. Proteolysis and Lipolysis of Goat Milk Cheese. Journal of Dairy Science, 84: 84-92.
Park Y.W., Juarez M., Ramosc M., Haenlein G.F.W., 2007. Physico-chemical characteristics of goat and sheep milk. Small Ruminant Research, 68: 88-113.
Raynal-Ljutovac K., Lagriffoul G., Paccard P., Guillet I., Chilliard Y., 2008. Composition of goat and sheep milk products: an update. Small Ruminant Research, 79: 57-72.
Ribeiro A.C., Ribeiro S.D.A., 2010. Specialty products made from goat milk. Small Ruminant Research, 89: 225-233.
Silveira E.O., Neto J.H.L., Silva L.A., Raposo A.E.S., Magnani M., Cardarelli H.R., 2015. The effects of inulin combined with oligofructose and goat cheese whey on the physicochemical properties and sensory acceptance of a probiotic chocolate goat dairy beverage. LWT-Food Science and Technology, 62: 445-451.
Sosnowski M., Rola J.G., Osek J., 2016. Alkaline phosphatase activity and microbiological quality of heat-treated goat milk and cheeses. Small Ruminant Research,136: 132-136.
Thum C., Cookson A., McNabb W.C., Roy N.C., Otter D., 2015. Composition and enrichment of caprine milk oligosaccharides from New Zealand Saanen goat cheese whey. Journal of Food Composition and Analysis, 42: 30-37.
TÜİK, 2014. Türkiye İstatistik Kurumu, http://www.tuik.gov.tr/
USK, 2014. Dünyave Türkiye'de Süt Sektör İstatistikleri. Ulusal Süt Konseyi, http://www.ulusalsutkonseyi.org.tr/kaynaklar/arastirma_dosyalar/2014_05_22_905419.pdf
Vieitez I., Irigaray B., Callejas N., González V., Gimenez S., Arechavaleta A., Grompone M., Gámbaro A., 2016. Composition of fatty acids and triglycerides in goat cheeses and study of the triglyceride composition of goat milk and cow milk blends. Journal of Food Composition and Analysis, 48: 95-101.
Witczak A., Pohoryło A., Mituniewicz-Małek A., 2016. Assessment of health risk from organochlorine xenobiotics in goat milk for consumers in Poland. Chemosphere, 148: 395-402.