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# TRADITIONAL DAIRY PRODUCTS OF TURKEY MANUFACTURED FROM AWASSI SHEEP'S MILK

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### ABSTRACT

In Turkey, total milk production is around 10.5 million tonnes per annum and roughly 12% of this volume is produced from sheeps. Awassi sheep breed is one of the high yielding milking breeds with 90-155 kg milk production per lactation period. Awassi sheep breeding is fairly intensified in the Southeastern Anatolia region where Turkey's largest development project (namely GAP) is ongoing. Awassi sheeps milk is largely reserved for home and/or small scale production of some traditional dairy products including Urfa cheese, Tulum cheese, Örgü (braided) cheese, yoghurt and butterfat (sade yağ). This paper reviewes the manufacturing technologies of traditional milk products produced only from milk of Awassi sheeps.

### **INTRODUCTION**

The milking animal breeding in Turkey has not been developed yet as much as in some European countries, mainly due to the geographic and climatic conditions. Turkey's total milk production is around 10.5 million tonnes per annum, and 83% of the total volume is produced from cows, followed by sheeps (12%), goats (3%) and buffaloes (2%) (Anonymous, 2001). Almost 20-25% of the milk produced is processed by modern dairy factories and the rest of the milk is either converted into milk products by small/medium scale dairies having obsolete technologies or sold directly as street milk. Special interest derives from the fact that most sheep and goat breeding farms are located in semi-mountanious or mountanious areas of the country where topoghraphy dictates that this is the best way of exploitation. Dairy sheep and goat breeding in Turkey continues to be, even today, in most cases, a secondary occupation for the farmers, their income coming mainly from other sources because of the

difficult geographic and climatic conditions. Among the milking sheep breeds, Awassi and Sakız breeds have distinct places due to their high milk yield. There are many traditional dairy products produced by using sheep's milk in Turkey. This paper focuses on the production technologies and gross compositions of some traditional dairy products made from only milk of Awassi sheep breed.

### **Awassi Sheep Breed**

The Awassi is the typical sheep breed of the so-called historical Mesopotamia region covering Southeastern part of Turkey, Iraq, Jordan, Syria, Lebanon and Israel (FAO, 1986). In Turkey, breeding of Awassi sheep is mainly intensified in Gaziantep, Şanlıurfa and Mardin provinces. It is also found in Hatay and Adana provinces of Eastern Mediterranean part of the country.

The sheep husbandry sector in Turkey is on an apparent trend of decline. This trend has its most visible implications in the regions of Eastern and Southeastern Anatolia in Turkey. In 1983, while Turkey's total sheep population was 46 million, recently this figure dropped to 25.6 million (Anonymous, 2003). Awassi sheep breed occupies roughly 2.3% of Turkey's total sheep population (~575 000-600 000 heads) (Özcan et al., 1993). GAP region where Awassi sheep breeding is prevailing, hosts one of the World's largest agricultural based development projects. With the transition from dry farming to irrigated farming in GAP area (consisting Southeastern of Turkey) from 2000 onwards, animal husbandary has largely been replaced by plant production. Another problem which has been brought about by irrigation projects is that with the expansion of irrigation, the pastures have become shrunk. This is eventually a threatening situation for local animal breeds of the region including Awassi sheep breed. At present, there is no any *in situ* conservation program in Turkey for Awassi sheep breed. During the last two decades, efforts have been intensified to cross-breed Awassi sheep with other local breeds of Turkey. Some examples are cross-breeding Awassi breed with Kıvırcık and White Karaman breeds.

The milk production capacity of Awassi breed is relatively high compared with the other local breeds with the exception of Sakız breed (Yıldız and Yıldız, 2002). The average lactation period and milk yield of Awassi sheeps are 200 days and 90-155 kg per lactation period, respectively.

Ceylanpinar State Farm (Ceylanpinar TİGEM) has the largest Awassi sheep flocks with 25 000 milking sheeps. Also, in the villages located alongside the Syrian border, there are some small Awassi sheep flocks, each has 200 to 300 ewes. The major milk products produced from Awassi sheep milk are Urfa type white brined cheese, tulum cheese, örgü (braided) cheese, yoghurt and butter/butterfat. It is estimated that total Awassi sheep's milk production in Southeastern Anatolia is around 60 000 ton per annum and more than 50% of this amount is converted into Urfa cheese. There is only one well-equipped dairy factory in the region producing only tulum cheese from milk of Awassi sheeps at industrial level. The production capacity of the factory is around 20 tons per day and all of the tulum cheeses manufactured is exported. There are some small scale dairy farms in the Southeastern Anatolia region processing sheeps milk on seasonal basis. The majority of the sheep's milk cheese produced traditionally under primitive conditions is sold in domestic markets.

### **Traditional Turkish Dairy Products Made from Awassi Sheep Milk**

### **Urfa Cheese**

The manufacture of Urfa cheese from milk of Awassi sheeps is intensified between February and early May. After mid May, most of the sheep's milk is used for yoghurt and butterfat production. Urfa cheese is a white-brined, semi-hard cheese variety native to Southeast of Turkey (Özer et al., 2003). The cheese is characterised as having no rind, a white colour, close texture and a salty acid taste. The production of Urfa cheese is somewhat similar to Feta cheese-making with the exception that in the former product whey drainage is achieved by leaving the curd hanging in special cheese loth (known locally as 'parzin') (Toufeili and Özer, 2006). In addition, Urfa-type white cheese is usually scalded in the whey at 85-90 °C for 2-3 min before brining (Özer et al., 2004a). No starter culture is used in the manufacture of traditional Urfa cheese; however, recent studies indicated that thermophilic lactic acid bacteria are suitable for improving the texture and aroma/flavour characteristics of the resulting product (Atasoy, 2004). The Urfa cheese production is outlined in Figure 1 and gross chemical composition of Urfa cheese produced traditionally is given in Table 2.

The yield of Urfa cheese made from milk of Awassi sheep breed varies between 20.3 to 24.8 kg per 100 kg of milk. The major problem of Urfa cheese production is that the production of cheese has not been industrialized yet. Therefore, basic hygienic measures are often neglected during and after production. This eventually leads to product loss and health problems caused by cheese-borne pathogens (Özer et al., 2004b). Similarly, since the production of Urfa cheese is achieved at home scale, it is not always possible to keep the

#### Raw ovine milk (Awassi breed) ★ Renneting

(at 32 °C with amount enough to coagulate milk within 60 min)

Cutting the coagulum

(approximately 1 cm<sup>3</sup> parts)

¥

Wheying-off by gravitiy drainage

(in a special cheese cloth called "parzin", at room temperature for 12 hours)

¥

Dry salting

(overnight at room temperature)

¥

### Scalding

(by keeping cheese blocks in boiling cheese whey for 1-3 min or by pouring boiling cheese

whey onto the cheese blocks)

¥

Storing in brine at <10 °C for >90 days

(15%, w/v, in boiled brine)

Figure 1. Schematic of traditional Urfa cheese production. (After: Özer et al., 2002).

**Table 2**. Gross composition of Awassi sheeps milk and Urfa cheese made from such milk (%)

(Atasoy, 2004).

	Total solids	Fat	Lactose	рН	Protein	Ash
Milk	$18.18\pm0.185$	$7.25\pm0.104$	$3.93\pm0.06$	$6.53\pm0.003$	$6.18\pm0.046$	$0.82\pm0.05$
Urfa Cheese	$46.51\pm0.185$	$25.58 \pm 1.041$	$4.20\pm0.07$	$5.14 \pm 0.117$	$15.23 \pm 0.071$	$1.50\pm0.001$
Urfa Cheese	$8.26\pm0.087$	$1.09\pm0.023$	$4.98\pm0.03$	$6.36\pm0.075$	$1.73\pm0.021$	$0.46\pm0.01$
whey						

chemical composition of the resulting product constant which makes legal monitoring processes of the cheese difficult (Özer et al., 2004a). Considering the potential of Awassi sheep's milk production of Southeastern Anatolia and consumer's demand towards Urfa cheese, the producers should strongly be encouraged to shift their production models from home scale to industrial scale.

### **Tulum Cheese**

Tulum cheese is a hard cheese traditionally ripened in a goat skin. At industrial level, the goat skin is replaced by special cheese moulds. This cheese variety has a thin, dry and yellowish rinds. Its body is homogeneous with no gas holes and it has a piquant rancid and sharp flavour (Koçak et al., 2005). In the manufacture of Tulum cheese, coagulation is achieved within 60-150 minutes at 32-34 °C either by means of home-made rennet or by commercial coagulants of animal origin. Coagulum is cut into 0.5-3.0 cm<sup>3</sup> parts and is poured into a cheese cloth bag. The whey separation is achieved by means of hanging cheese cloth bags for 14-16 hours at ambient temperature (Koçak and Gürsel, 1992). Afterwards, the coagulum is pressed fro 6-24 hours until desired total solids level is attained and then cut into small pieces by hand. Small cheese pieces are dry salted with NaCl at concentrations of 2-3%. Salted cheese curd is transfered into cheese moulds and pressed so that the air inside the mould is removed. The cheese moulds are placed into cold stores with 75-85% relative humidity. The Tulum cheese is ripened at 4-12 °C for up to 120 days (Koçak et al., 1995). In the Southeastern Anatolia region, Tulum cheese is largely produced from milk of Awassi sheep's milk. The total Tulum cheese production from Awassi sheep's milk is around 550-600 tons per annum and almost 80 percent of this amount is exported. The basic production steps of traditional Tulum cheese is illustrated in Figure 2.

### Raw ovine milk (Awassi breed)

Renneting (at 32-34 °C with amount enough to coagulate milk within 60-150 min) Cutting the coagulum (approximately 0.5-3 cm<sup>3</sup> parts) Wheying-off by gravitiy drainage (in a special cheese cloth called "parzın", at room temperature for 14-16 hours) Breaking the curd by hand into small pieces Dry salting (2-3% NaCl) Placing salted cheese pieces in moulds or goat skin Pressing the moulds to remove air from the cheese Ripening at 4-12 °C for 90-120 days with 75-85% humidity

Figure 2. Schematic of traditional Tulum cheese production. (After: Yener and Koçak, 2000).

### Örgü Cheese (Braided Cheese)

Örgü cheese is somewhat similar to Mujaddal or Braided cheese which are native to Lebanon and some other Middle Eastern countries. Örgü cheese production involves intensive manual handling during the manufacturing stage, and requires skilful manupilation of the curd by the cheesemaker (Toufeili and Özer, 2006). The Örgü cheese is made by warming the milk to 38-40 °C, adding CaCl<sub>2</sub> at a level of 0.2 g/100 g, renneting by animal origin coagulant, cutting the coagulum into small cubes and straining in a cheese cloth. The curd is left to ferment at 45 °C until the pH 5.0-5.1 is attained, relying on the indigeneous raw milk flora and, as a consequence, the curd pieces fuse into a continuous mass. The fused mass is cut into portions (3x3x2 cm) and scaded in boiling water or cheese whey. This process leads to a plastic mass amenable to streching by the cheesemaker (Toufeili and Özer, 2006). Then, the scalded cheese mass is shaped into a loop (i.e. 70-75 °C); the loop is split into medium thick strands and knotted at one end to form the final product. The cheese is stored in cold water for overnight and then ripened in brine (15% NaCl). The Örgü cheese eproduction is outlined in Figure 3.

Raw ovine milk (Awassi breed) Warming up to 38-40 °C Adding CaCl<sub>2</sub> (0.2 g/ 100 ml milk) Renneting (at 32 °C with amount enough to coagulate milk within 50 minutes) Cutting the coagulum (approximately 1 cm<sup>3</sup> parts) Wheying-off (at 45 °C; until pH 5.0-5.1) Scalding in boiling water to plasticise the curd Streching by hand and shaping into a loop (at 70-75 °C) Refrigeration of the cheese mass overnight Storing in brine at <10 °C for >90 days (15%, w/v, in boiled brine)

Figure 3. Schematic of traditional Örgü (braided) cheese production.

### Yoghurt

Another dairy product which is manufactured from milk of Awassi sheeps is yoghurt. Yoghurt production in Eastern and Southeastern Anatolia is primarily achieved at home scale and traditional yoghurts are sold in local bazaars. The amount of sheep's milk yoghurt sold in local bazaar in Southeastern Anatolia is estimated to be 10-15 tons per day. Comparing with cow's milk yoghurt, sheep's milk yoghurt is much thicker in consistence and more palatable. Therefore, the market demand for sheep's milk yoghurt is always high even it is slightly more expensive than yoghurts made from other milk species. The technology of traditional yoghurt production is rather simple. As sheep's milk is rich for total solids and proteins, there is no need to increase total solids level of milk as is a common practice for yoghurt production from cow's milk. Sheep's milk is heated up to 90-95 °C for 5-10 minutes to kill off any lactic and non-lactic microorganisms present in raw milk. Then, milk is cooled down to 40-45 °C and inoculated with yoghurt of previous days. Incubation is allowed until the milk is set (pH is around 4.6-4.6) and then the fermented milk is cooled to <10 °C (Özer, 2006). In some cases, in order to give yoghurt a piquant taste, the milk is kept at boiling temperature for 10-15 minutes before fermentation.

### **Butter and Butterfat**

One of the traditional ways of using milk of Awassi sheeps in Southeastern Anatolia is the production of butterfat (localy known '*sadeyağ*') directly from yoghurt. In general, butter and butterfat are produced industrially by churning milk fat. However, in Şanlıurfa and Mardin provinces, local villagers churn the yoghurt produced from sheep's milk and concentrate the milk fat. Acidic nature of yoghurt makes it easier to agglomerate the fat globules and characteristic yoghurt aroma/ flavour makes the butter tastier. This product has a fat content of 82-85 %. Butterfat is obtained by boling the butter obtained from yoghurt and the fat level of butterfat is around 98-99%. Butterfat is primarily used in the production of traditional desserts. There is no statistical data available on the amount of butterfat manufactured from Awassi sheep's milk in the Southeastern Anatolia region. However, some of the largest dessert producing companies in Turkey supply their butterfat demand which is estimated to be 50 tons per annum, from Şanlıurfa region. Additionally, the use of butter or butterfat from sheeps milk is very common in the preparation foods in the Southeastern Anatolia. Therefore, it is fair to assume that butterfat production is high enough to consider this product for manufacturing at industrial level. During production of butter or butterfat, the buttermilk (locally called '*ayran*' in Turkey) surplused after churning, is collected and further boiled to coagulate non-fat milk solids. The coagulated non-fat milk solids are washed with drinking water and mixed with table salt (1-2 g/100 g). This product is called '*çökelek*'. In some villages located alongside Syrian border, the buttermilk (ayran) is directly sun-dried (*ayran kurusu*) and kept for consumption during winter season. Butterfat, çökelek and ayran kurusu production from sheeps milk is illustrated in Figure 4.



Figure 4. Production of butterfat, çökelek and ayran kurusu from yoghurt manufactured from milk of Awassi sheep

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