

UDC 637.35.04

SCOPUS CODE 1106

<https://doi.org/10.36073/1512-0996-2023-4-26-35>

Technology of the Georgian Artisanal Tenili Cheese – State of the Issue and Prospects of its Production

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Abstract.

Different types of cheese have been made in Georgia since ancient times. Unique artisanal tenili cheese is made in Southern Georgia. There is no exact analogue of the tenili cheese in the world. The technology of tenili cheese making based on the study of ethnographic literature and description of local population is presented. Nowadays tenili cheese is made in two different ways. Main differences between them are fat content of used milk, liquid where hand processing of cheese mass is occurring, and utensil for ripening. The research confirmed necessity to study tenili cheese's microbiological, chemical and sensory characteristics to evaluate significance and impact of each technological step on final product and to access consumer acceptance. Products with Geographical indication are in high demand and play an essential role in the regional development. Obtained results will disseminate awareness about tenili cheese not only in Georgia, but also in the world.

Keywords: georgian cheeses; geographical indication; Meskhetian chechili; pasta filata.

Introduction

Domestication of dairy cattle has been back to nearly 10 000 years ago probably on the western Turkish-Syrian border [1], moreover, isotope analysis of organic material revealed traces of milk in excavated pottery, indicating the storage of dairy products already 9000 BP [2]. In the territory of modern Georgia (village Darkheti, municipality of Chiatura), bones of domesticated animals (including cows and sheep) have been found in the fossils of the early Neolithic period, which indicates the existence of cattle breeding. The quantitative analysis of osteological material dated by the VI-IV millennium B.C.E. (archaeological site "Shulaveris Gora", Qvemo Kartli, Georgia) confirmed the predominant existence of cattle [3, 4]. Paleozoological and

osteological data, materials discovered as a result of archaeological excavations in the territory of Georgia, clearly shows the place and role of the Caucasus in the domestication of animals, the genesis and development of early forms of animal husbandry [5, 6].

The cheese was produced from the earliest civilizations 8000 years ago around the Euphrates and Tigris rivers in Iraq [7]. VIII-VII millennium BC were most important period in manking's history and relevantly in history of Caucasus region. During this period were developed household-cultural types which gave start later cattle-breeding and dairying forms. The rich ceramic material, among them "dergi" (so-called in Georgian) are obtained as a result of archaeological excavations on the territory of modern Georgia, in particular, in archeological sites – Shulaveri and Imiri. "Dergi" is a small jar, in a shape of "qvevri" (egg-shaped vessel) [8]. These jugs probably were used for storing not only cereals, but also milk products. They are presented in the Simon Janashia State Museum (Tbilisi, Georgia) and are dated by 6th-2nd millennium B.C. In the ethnographic existence, such clay vessels are used for cheese storage [9].

Production of cheese in the world was based only on farms till the 18th century. The first industrial cheese-making plant opened in 1851 in the USA and in 1870 – in UK [10]. In Georgia, in 1864, with the support of the government of Georgia, in the village Alexandershilf (now village Trialeti, municipality of Tsalka) by the new settlements of German colonists' and in the village Mamutli of the Borchaly uezd (now village Mtisdziri, municipality of Dmanisi) by German baron von Kuchenbach the factories for Swiss cheese production were found [11-13]. Both factories were opened at the same time, but the first was based on artel basis, and the second was the property of the founder [14]. The noted cheese and butter factories of Kvemo Kartli has not any influence on the production of the local dairy farms. Local cattle breeding and cheese making for Georgian small farmers pass off their own way of development – the locals used cow's, sheep's and buffalo's milk; from cow's and sheep's milk they were making cheese; from

sour skimmed milk – chechili cheese; cheese was also made from raw unskimmed milk, which is called "moukhdeli" (unskimmed), and cheese from sheep's milk is called "tavi-kveli" (head-cheese) [12].

Nowadays, cheese is produced everywhere and different number of cheese varieties (from 400 to 1000) have been described. There have been many attempts to classify cheese into groups based on its various characteristics for every taste preference and a taste preference for every cheese [15]. Factors influencing and determining significant differences in the taste, rheology, and flavor of cheese, are as follows: type of milk, heat treatment of milk, method of coagulation, type of rennet, cheese mass processing, application of molds and place their usage, salting, duration of ripening, fat content, amount of moisture, etc. [16, 17, 18]. The climate, landscape, soil consist have also an impact on the milk composition and, consequently, on cheese characteristics [19].

Today, cheese is produced not only at industrial, but also at an artisanal level. Artisanal cheese producer is the person who uses milk obtained locally, has small scale equipment and uses traditional methods for cheese production [20]. Artisanal production uses starter cultures which are natural habitants of raw milk and represents a mix of the conventional unspecified strains. These starters are used only in traditional cheese making in different parts of the world [7].

In 2016, the European Guide for good hygiene practices was created to produce artisanal cheese and dairy products for the target group of farmhouse and artisan producers. The guideline contains details of good hygiene practices and is a voluntary tool intended to apply specific practices in farmhouse and artisan cheese dairy production. Practical and preventive recommendations are created to help producers to process safe products. The Guide involves general hygiene requirements and is in compliance with EU regulation and principles of HACCP. It also contains exemptions for small scale farmers while using traditional methods for processing food [20].

Main Part

Diversity of Georgian Traditional Cheeses

Different types of cheese have been made from sheep's and cow's milk in Georgia since ancient times [21]. From the last century among dairy products relatively widespread Tushuri, Kobi, Imeruli, sulguni and many other types of cheeses [22]. In Georgia cheese have been made both as from scimmed milk also from the milk without scimming [23]. Many of Georgian cheeses were forgotten or area of production significantly reduced for economic reasons [24].

In 2017 published the catalog of Traditional Georgian Dairy Products, prepared by supporting of the Agricultural Service of the USDA. The Catalog contains information about 24 different types of cheeses traditional for different regions of Georgia [18]. Each historical part of Georgia had its own variety of cheese: Tushuri guda cheese, Imeruli cheese, Chechili, tenili, Suluguni and others [11]. In some regions of Georgia same cheeses are reffered with different names. For example sulguni which is produced in Samegrelo, Svaneti, Imereti, Lechkhumi, and Racha is named as “selegeni” in Samegrelo, “siogini” in Zemo Imereti, in Racha and Lechkhumi is known as a “gvarjila/gvarjili”, in Guria – “gadaselili” [25]. 13 out of the traditional Georgian cheeses are protected as the geographical indication by the National Intellectual Property Center of Georgia Sakpatenti: chogi, tenili, Georgian cheese, Adjarian chlechili, Meskhuri chechili, Megruli sulguni, sulguni, Svanuri sulguni, Kobi, guda, Tushuri guda, Imeruli cheese, dambalkhacho [26]. Today, the demand for dairy products is growing in Georgia, but production is gradually decreasing. In 2018, the self-sufficiency ratio was 81%, and in 2009 it was 92% [27].

Meskhethian chechili and tenili cheeses

The technology of making dairy products in all parts of Georgia is unique. Among them is Samtskhe-Javakheti, where historically milk and milk products have played an important role and were characterized by great diversity. The inhabitants used milk as food and

prepared various products and dishes from it. Nevertheless, many traditional products are no longer produced in Samtskhe-Javakheti with the same intensity as before, traditional dishes still play an essential role in the daily diet of the local population [28]. Many types and denominations of cheese were made in Samtskhe-Javakheti, including Meskhethian chechili, tenili, guda cheese, “jeruli”, “natsari” [29].

Meskhethian chechili and tenili as well as other Georgian cheeses – sulguni from different regions, Adjarian chlechili, can be classified as a type of pasta filata type cheeses. Pasta filata is an Italian phrase that means “stretched curd”. These types of cheeses are also known as “kneaded” or “plastic curd” cheeses because curds are kneaded and stretched. They have common unique fibrous, malleable, sliceable texture, which comes from the stretching step (7). The process of stretching represents an adequate heat treatment of the fresh curd. The practice probably originated as a means of preservation to improve the quality and prolong the shelf-life of the cheese by thermal inactivation of some microorganisms and enzymes. Stretching changes, the amorphous three-dimensional matrix of the curd into an oriented structure, where fat and whey is accumulated. This architecture gives unique textural and melting characteristics. These properties have proven to have fundamental importance in the popularity of pasta filata cheeses. These types of cheeses are mainly originated from the Mediterranean region of Italy, Greece, the Balkans, Turkey and Eastern Europe [30].

Denomination of tenili goes from Georgian word “წაჭეწილი”, which means pressed (traditionally, ripening of tenili cheese take place in pressed state) [25]. Visual analogues of tenili and Meskhethian chechili cheeses are met in other countries because one of the essential parts of the technological process is similar to those of the cheeses mentioned above, which implies a visual resemblance to the final product. Cheese with the same visually and similar denomination – չԷԷճԻլ or Էժ panir, consider one of the traditional cheeses in Armenia [31]. None of the Armenian cheeses are registered as a

geographical indication (GI) or appellation of origin (AO) [32]; In Turkey, cheese with the same appearance is known as an “Erzurum civil peyniri”, which has the status of geographical indication from the Turkish Patent Institute. The production area is a geographical region formed by Erzurum province and its districts [33]. “Majdoule” is one of the Syrian specialty white cheeses which cover 85 to 90% of the processed market in Syria [34]. There are other names of cheeses with similar appearance in the middle east of Syria: Syrian string cheese and its Arabic name – “jibneh mshallaleh” [35]. Oaxaca cheese is an irreplaceable product in Mexican cuisine known as “quesillo” or “thread cheese”, which is produced as in a big scale plant also as an artisanal cheese [36].

Status and technology of tenili cheese

The signing of the Association Agreement (Deep and comprehensive free trade area) with the European Union, trade and economic relations between Georgia and the European Union have reached a qualitatively new level, emerged new opportunities for Georgian products to enter the EU market where food production is built entirely on quality policy. Tenili cheese has a status of geographical indication in Georgia since January 24, 2012 (registration number 5) [37]. The system of geographical indications is designed to ensure the quality of agricultural products, protect the interests of consumers, and provide conditions of fair competition for producers [26, 38]. Organoleptic characteristics and compositional requirements of tenili cheese according to the Geographical indication are presented in Table 1.

Organoleptic characteristics				
Consistency		Soft, elastic		
Smell		Pleasant, specific		
Taste		Fresh, currant, slightly sour		
Compositional requirements				
Humidity, not more than		60%		
Fat content in dry matter, not less than		45%		
Salt content		2-4%		
Milk origin	Specific gravity not less	Non-fat dry matter content (%) not less than	Fat content (%) not less than	Acidity (°T) not more than
Cow	1.027	8.1	4	18
Sheep	1.031	11.5	7	26

Table 1. Organoleptic characteristics and compositional requirements of tenili cheese [37]

From the November 10th, 2016, tenili cheese is protected by geographical indication in the EU Member States under agreement [39].

The technology of distinctive making of tenili cheese received the status of intangible cultural heritage at the national level on November 15, 2013, according to the

order #03/207 of the Minister of Culture, Sports and Youth of Georgia [40]. The technology of its production within the above status is considered as shared experience related to the outside world, traditional handicrafts.

In Fig. 1 flow-chart of tenili cheese making based on the experience of locals of village Chobareti (Aspindza munitsipality, Georgia) is presented. It should be marked

that actually, tenili cheese is processed only in the villages Chobareti and Andriatsminda (Akaltsikhe munitsipality, Georgia) [41]. There is a few literature sources about the technology of tenili cheese making; in fact, only ethnographic, culinary or newspaper material. According to S. Makalathia (1938) tenili is cheese that is cut and put in a clay pot [29], concerning to R. Topchishvili (2014) tenili is chechili cheese put in a clay pot with cream [25]. Actually, the newspaper articles are focused only on the unique visually of tenili cheese [24, 42, 43]. Small information about tenili cheese is given also in culinary and popular literature [28, 44]. The only

scientific article has been published about the tenili cheese production by a machinery method [45].

Like other elements of everyday culture, food products and dishes undergo changes over time [28]. Nowadays, the population of Samtskhe-Javakheti is changing the traditional technology of making tenili cheese. According to the existing knowledge and studying ethnographic literature there are significant changes in the technology developed over time and, actually, there are two different ways of tenili cheese making (Fig. 1):

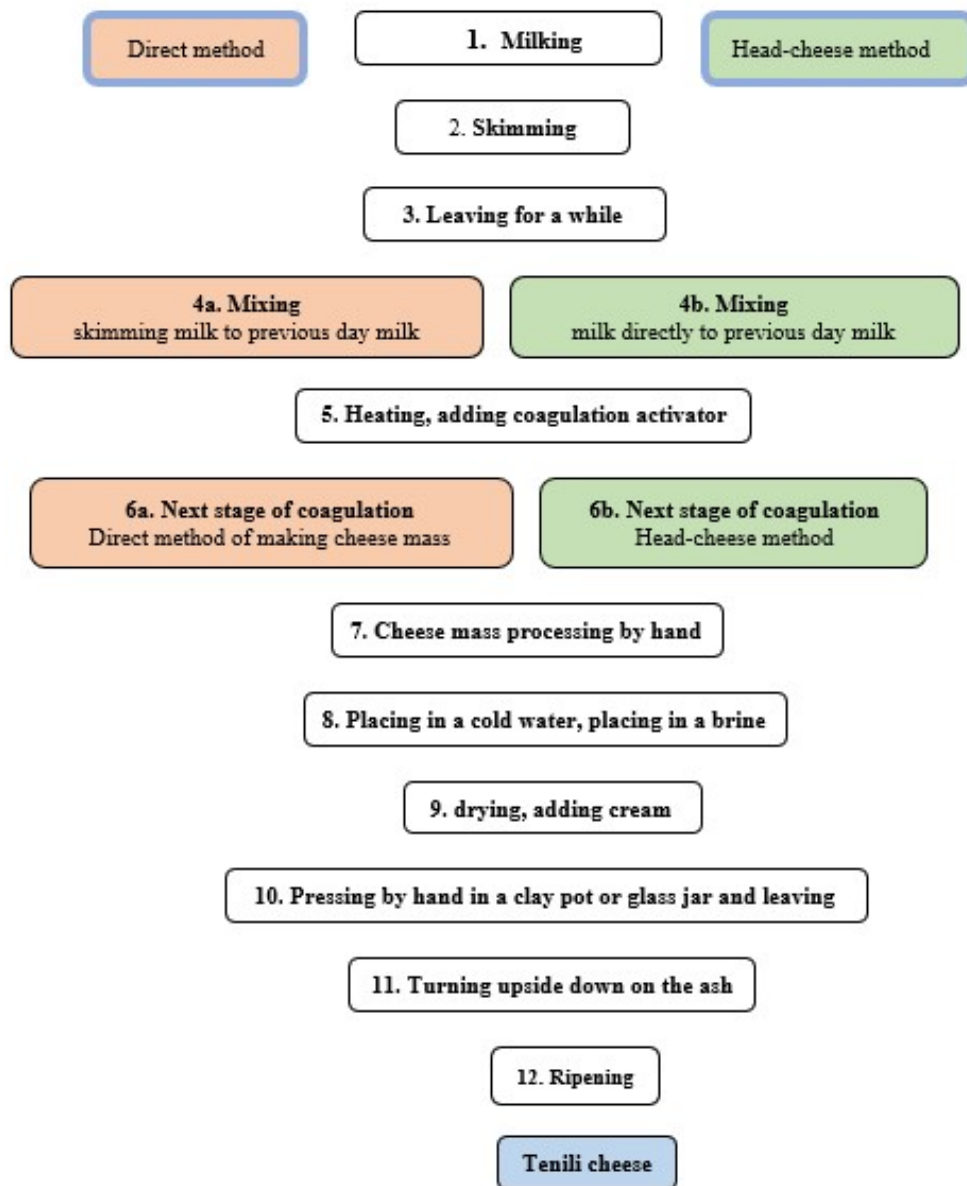


Fig. 1. Flow-chart of tenili cheese making described by locals (village Chobareti, Aspindza munitsipality, Georgia)

1. Direct (traditional) method – the next morning after milking, the milk is skimmed and mixed with the soured milk from the previous day.

2. Head-cheese method – next morning, after milking, milk is directly (without skimming) mixed with the soured milk from the previous day.

For both cheese-making methods, milk requires time to be ready for processing, it should not be too acidic (such milk is no longer used) and not too sweet, local cheesemakers decide of milk readiness by verifying with tasting – by pouring a small amount of milk and putting the mass on the fire. If the milk is boiled, it is too sweet and more time is needed to become acidic. If a stretchy mass is received, milk is ready for cheese making. The next stage is heating well-acidified milk at 37-40°C (hand should be “bitten” according to the knowledge of locals) and adding the coagulation activator (pepsin/rennet or a mixture of pepsin and rennet).

The mass obtained by the direct method (step 6a) is processed until the whey becomes transparent and is separated from the cheese mass.

In case of the head-cheese method (6b), curd mass is cut into pieces, re-heated, the grain is collected and placed in forms for ripening and draining. After ripening (whether it is ripe or not, is determined by the farmer

who is assessing the taste and smell), cheese mass is cut into small pieces, put into hot water, and gently formed with a spoon into one mass.

7th step is common for both methods of cheese making – cheese mass is processed by hand, which is one of the crucial stages in this type of cheese. The cheese mass is slowly stretched during the processing by pressing and moving in the hot whey for direct method and in the hot water for head-cheese method. Cheesemaker continues this process until cheese mass turns into thin strands as hair, which requires a specific time (depends on the initial mass of cheese).

Once stretching is finished, mass of cheese is immersed (8th step) at first in the cold water for a few minutes to avoid sticking of cheese strands to each other, and then they are transferred to the brine 15-18% for hardening, which is essential for the texture of the final product; sometimes locals are using rock salt. Keeping cheese strands in the brine for a long time causes their excess hardening and has impact on bacterial composition and process of cheese ripening [11, 46].

The process continues with stage 9. After removing the brine, cheese strands are squeezed hard with hands to remove excess liquid, drying in a cloth, and then hung on a wooden pole (Pic. 1).



Pic. 1. Drying tenili cheese threads in the cloth and on the wooden pole

After drying cheese is cut and mixed with cream (cream obtained at stage 2), pressed by hand into the clay pot or glass jar and cloth tied with rope on the top. Two days later, glass jar/clay pot are placed on the ash upside down (Pic. 2) in the basement, where the temperature is

around 12-16 °C. Traditionally, clay pots were used for storage and ripening of tenili cheese in Meskheti [28, 29, 45]. Tenili cheese can be consumed as ripened, also directly without maturing. Local people are ripening tenili cheese up to 6 months.



Pic 2. Utensils for tenili cheese ripening

The main differences between direct (traditional) and head-cheese methods are:

1. Amount of fat in the milk used for cheese processing which has impact on salt intake capability, that significantly influences on the taste characteristics of the product at different stages of ripening.

2. Different liquids: water and whey for hand processing step. They may have huge significance on the final product microbial composition.

3. In Georgia, from the beginning of the 20th century, as a ripening utensil used not only a clay pot but also glass jar. Changing of the clay pot with other utensil was conditioned by the simplicity and easy access to hygienic norms [47], but cheese ripening in a clay pot creates slightly different conditions due to the structure of the clay.

Today, fewer and fewer people make tenili cheese in Meskheta. According to the meetings organized by the Georgian Business Development Center Caucasus Akhaltsikhe Office, today the main problems for locals are poor infrastructure and sales issues.

Artisan tenili cheese should be considered as “slow food”, which is defined by three interrelated principles: good (i.e., high-quality, flavorful, and healthy food), clean (i.e., production that doesn't harm the environ-

ment), and fair (i.e., reasonable prices for consumers and fair working conditions and payment for producers). Maintaining of culinary culture and tradition is vital to the “slow food” idea [48].

Conclusion

Tenili cheese is one of Georgia's unique artisanal dairy product, and no exact analogue is known in the world. However, tenili cheese is slowly disappearing because only old generations are making it in a few villages in the region of Mtskheta.

As a result of receiving the existing knowledge among the population of Samtskhe-Javakheti and studying the ethnographic literature, the changes in the technology of tenili cheese production were revealed.

Our unique cheeses, including tenili cheese, are good materials for making top-quality cheeses, but this requires research (no research is done on tenili cheese physical, chemical, microbiological, and sensory characteristics) about safe cheese-making conditions and the support of the local population, in order to maintain the basic characteristics developed over centuries and based on the existing knowledge improve cheese making technology to be acceptable to other peoples over the world.

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UDC 637.35.04

SCOPUS CODE 1106

<https://doi.org/10.36073/1512-0996-2023-4-26-35>

ქართული არტიზანული ტენილი ყველის ტექნოლოგია – საკითხის თანამედროვე მდგომარეობა და წარმოების პერსპექტივები

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ანოტაცია. საქართველოში უძველესი დროიდან ამზადდებდნენ სხვადასხვა სახის ყველს. უნიკალური არტიზანული ყველი ტენილი მზადდება სამხრეთ საქართველოში. მსოფლიოში არ არსებობს მისი ზუსტი ანალოგი. კვლევაში წარმოდგენილია ტენილი ყველის დამზადების ტექნოლოგია არსებული ეთნოგრაფიული ლიტერატურის შესწავლისა და ადგილობრივ მოსახლეობაში არსებული ცოდნის გაზიარების საფუძველზე. დღეისათვის ტენილი ყველი მზადდება ორი სხვადასხვა გზით, რომელთა შორის ძირითადი განსხვავებაა ყველის დასამზადებლად გამოყენებული რძის ცხიმთანობა, სითხე, რომელშიც ხდება ყველის მასის ხელით დამუშავება და დასამწიფებელი ჭურჭელი. კვლევამ დაადასტურა ტენილი ყველის მიკრობიოლოგიური, ქიმიური და სენსორული მახასიათებლების შესწავლის აუცილებლობა, რათა შეფასდეს თითოეული ტექნოლოგიური ნაბიჯის მნიშვნელობა, გავლენა საბოლოო პროდუქტზე და აამაღლოს მომხმარებლის მიერ ტენილი ყველის მიმდებლობა. გეოგრაფიული აღნიშვნის პროდუქტები მოსახლეობაში დიდი მოთხოვნით სარგებლობს და მნიშვნელოვან როლს ასრულებს ქვეყნის რეგიონულ განვითარებაში. მიღებული შედეგები გაზრდის ტენილი ყველის ცნობადობას არა მხოლოდ საქართველოში, არამედ მთელს მსოფლიოში.

საკვანძო სიტყვები: გეოგრაფიული აღნიშვნა; მესხური ჩეჩილი; პასტა ფილატა; ქართული ტრადიციული ყველი.

The date of review 17.10.2023

The date of submission 18.10.2023

Signed for publishing 21.12.2023