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The Effect of Beeswax Coating on the Organoleptic and Chemical Parameters of Tushetian Guda Cow Cheese

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ABSTRACT

This paper presents the organoleptic and chemical analysis of Tushetian Guda cow cheese (control) made using standard technology and Tushetian Guda cow cheese coated with beeswax. The study aimed to examine the effect of beeswax coating on the organoleptic and chemical parameters of Tushetian Guda cow cheese. The results revealed that the use of beeswax coating improved the physical durability of the cheese, extended its shelf life, and preserved its quality, texture, taste, and aroma. Storing Tushetian Guda cow cheese in beeswax inhibits the development of slime and mold on the surface, protects the cheese from significant moisture loss, and maintains the texture and characteristic taste properties of cow cheese. The flavor and aroma of the beeswax lend a piquant quality to Tushetian Guda cow cheese. Beeswax coating could become a new, eco-friendly, biodegradable, and safe alternative to the synthetic packaging materials currently used in cheese production.

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Few people know that Georgia is not only the land of wine but also the land of cheese. While the history of cheese production in other countries spans 4,000 years, in Georgia, an 8,000-year-old clay vessel—kvevri—used for storing cheese has been preserved. Officially, 14 types of cheese are registered in Georgia: dambalkhacho, chogi, tenili cheese, kalti, kobi, Adjarian chechili, Meskhetian chechili, sulguni, Megrelian sulguni, Svanetian sulguni, guda cheese, Tushetian guda, Imeretian, and Kartuli [1].

The health of the modern individual largely depends on a balanced, proper diet. Dairy products, particularly cheese, occupy a prominent place on the list of essential foods for a balanced diet. Cheese is a highly nutritious food product, rich in milk protein, fat, essential amino acids, and other biologically active substances. It is a scientifically proven fact that dairy products have a beneficial effect on the health of teeth and bones. Dairy products supply the human body with essential and beneficial minerals such as calcium, and phosphorus, as well as vitamins A and B2 [2]. It is known that the high calcium content in cheese positively affects blood pressure and is also highly effective in low-calorie diets aimed at weight loss. The linoleic acid and sphingolipids in cheese have anti-carcinogenic properties. Cheese is also a source of vitamin K2, which has a positive impact on cardiovascular diseases and regulates blood coagulation [3, 4].

Cheese is classified as a perishable product, which is why, under favorable conditions, pathogenic microflora may develop, negatively affecting the quality and taste characteristics of the cheese. Additionally, weight loss, fat oxidation, and enzymatic degradation are the main factors influencing the stability of cheese. Methods that can control these factors make it possible to extend the shelf life of cheese while preserving its quality characteristics.

According to literature sources, the main methods for extending the shelf life of cheese include the addition of preservatives, modified atmosphere packaging, high-pressure conditions, active coatings, and coatings that are edible. During prolonged storage, cheese must fully retain its quality. It is known that during storage, irreversible chemical and biochemical processes may occur in cheese, which affects its quality parameters [5].

Food packaging films and coatings protect cheese from physical, chemical, and biological degradation. The use of food packaging films, polymer-paraffin compositions, and beeswax coatings improves the physical durability of food products, the visual and tactile properties of the surface, and protects cheese from moisture loss, the growth of microbes on the surface, and the oxidation of nutrients.

Wax is a natural, environmentally friendly, biologically active product with strong bactericidal properties. Beeswax contains up to 300 different substances [6].

Storing cheese in a wax coating facilitates the proper formation of the surface, prevents the development of slime and mold on the surface, reduces moisture loss and weight reduction, enables prolonged storage, and thus helps maintain the quality of the cheese. It should be noted that beeswax has the potential to become a new, environmentally friendly, and safe alternative to vacuum packaging and synthetic packaging materials in general [7].

Tushetian Guda Cheese is a traditional Georgian cheese that belongs to the group of brined cheeses. There are three types of Tushetian Guda cheese: made from sheep's milk, cow's milk, or a mixture of sheep and cow milk (50%-50%). Guda cheese made from cow's milk is prepared using the highest quality raw whole milk. The cheese's uniqueness is primarily due to the high-quality, environmentally pure milk provided by Tushetian cows, a Georgian breed that grazes on the alpine pastures of Tusheti.

- The cheese matures in a sheep's guda, which is made from sheep's skin.
- Both the maturation and subsequent storage of the cheese occur in the guda. Guda cheese is characterized by a specific, pleasant aroma and a moderately salty, piquant taste [8].

Cheese is a perishable product, and its long-term storage while maintaining stable quality remains an unresolved challenge.

Based on the above, the goal of this research was to study the effect of a beeswax coating on the organoleptic and chemical properties of Tushetian Guda cow cheese.

Objects and Methods of Research

The objects of the research were:

1. Tushetian Guda cow cheese prepared using the standard technology (control).
2. Tushetian Guda cow cheese prepared using the standard technology and coated with beeswax.

The beeswax composition was applied to the dry cheese pieces as thoroughly as possible. For the Tushetian Guda cow cheese (control), parameters such as the mass fraction of dry matter, titratable acidity, protein content in dry mass, fat, and salt content were determined (Table 1). For the beeswax-coated Tushetian Guda cow cheese samples—Sample I and Sample II—storage was carried out at a temperature of +5°C, with maturation periods of one month and three months, respectively.

Results and Discussion

The results obtained demonstrate the quality of Tushetian Guda cow cheese and the possibility of extending its shelf life while maintaining its organoleptic parameters.

- Tusheti is located in the central section of the Caucasus Mountain range, in the northern part of eastern Georgia.
- The guda used for cheese storage is made from the skin of sheep, goats, or calves, with the hair shaved off from the inner side.

Table 1: Chemical Composition (Control) of Tushetian Cow's Guda Cheese

Research parameters	Research results		Research methods
	Sample I	Sample II	
Mass Fraction of Dry Matter, %	63	75	GOST 3626-73
Titratable Acidity, T°	160	260	GOST 3624-92
Protein in Dry Matter %	31,51	28,29	Kjeldahl Method [9]
Fat in Dry Matter, %	39,1	37	[9]
Salt, %	5,4	6,5	GOST 3627-81

Organoleptic and chemical parameters were determined in Tushetian Guda cow's cheese coated with beeswax—Sample I after one month of aging and in Tushetian Guda cow's cheese coated with beeswax—Sample II after three months of aging. The research results are presented in Tables 2 and 3.

Table 2: Organoleptic Parameters of Tushetian Guda Cow's Cheese Coated with Natural Beeswax

Quality Indicators	Research Results	
	Sample I	Sample II
Outer appearance	The surface of Tushetian Guda cow's cheese is coated with beeswax. The wax coating is undamaged. The color of the wax is natural yellow. No mucus or mold has developed.	The surface of Tushetian Guda cow's cheese is coated with beeswax. The wax coating is undamaged, and the wax is of a natural yellow color. The area in contact with the wax has a slightly yellowish tint. No mucus or mold has developed.
Taste and odor	It has the characteristic piquant taste and specific aroma typical of cow's cheese, a moderately salty flavor, and a slight hint of the beeswax aroma.	The characteristic dominant flavors of cow's cheese have been preserved. The taste is moderately salty, with a noticeable flavor and aroma of beeswax.
Consistency	The consistency of the cheese is uniform, firm, and slightly elastic. It is not crumbly or soft. The cheese slice naturally exudes teardrops, as it is high in fat.	The consistency of the cheese is firm, slightly elastic, and uniform. It is not softened or crumbly. The cheese slice retains its fat content.
appearance	The cut cheese has holes of various shapes and sizes inside.	The cut cheese has holes of various shapes and sizes inside.
The color of the cheese interior	With an intensely yellowish hue	With an intensely yellowish hue

Table 3: Chemical Parameters of Tushetian Guda Cow's Cheese Coated with Natural Beeswax

Research parameters	Research results		Research methods
	Sample I	Sample II	
Mass Fraction of Dry Matter, %	63,2	76,1	GOST 3626-73
Titratable Acidity, T°	160,5	270	GOST 3624-92
Protein in Dry Matter %	31,52	29,5	Kjeldahl Method [10]
Fat in Dry Matter %	39,2	38,1	[10]
Salt, %	5,4	6,6	GOST 3627-81

The results showed that after one month of aging, the surface of the Tushetian Guda cow's cheese coated with beeswax (Sample I) remained undamaged, with the cheese's firmness and texture preserved. The dominant flavors of the Tushetian Guda cow's cheese remained intact, with a slight aroma and taste of beeswax, which imparted a piquant quality to the cheese. After three months of aging, the surface of Sample II also remained undamaged and maintained a natural yellow color. The characteristic dominant flavors of the cow's cheese were preserved. The cheese was moderately salty, with a noticeable taste and aroma of beeswax. The interior color of the cow's cheese was an intense yellow, with the area in contact with the beeswax taking on a yellowish tint. The taste and aroma of beeswax were more pronounced, blending with the piquant and distinct flavors of Tushetian Guda cow's cheese.

As for the chemical parameter analysis, the mass fraction of dry matter in the beeswax-coated Tushetian Guda cow's cheese samples, Sample I and Sample II, was 63.2% and 76.1%, respectively. Depending on the aging time of the cheese, the titratable acidity and salt content changed. It should be noted that based on the results obtained, further research should be planned to determine the microbial spectrum of cheese stored in beeswax coatings.

Based on the conducted research and the literature review, we can conclude that the use of beeswax coating helps improve the physical stability of Tushetian Guda cow's cheese, as well as the visual and tactile characteristics of the surface. Storing Tushetian Guda cow's cheese in beeswax prevents the development of mucus and mold on the surface, while also protecting the cheese from significant moisture loss, maintaining its texture, and preserving the characteristic taste properties of cow's cheese. The taste and aroma of beeswax impart a significant piquancy to the cheese. The beeswax coating could potentially become a new, eco-friendly, biodegradable, and safe alternative to the currently used packaging materials in cheese production.

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