

STUDY OF TRADITIONAL TECHNOLOGICAL FLOW AND PHYSICO-CHEMICAL ANALYSIS ON GOAT MILK YOGURT OBTAINED INTO A SMALL RANGE UNIT FROM IAȘI COUNTY, ROMANIA

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Abstract

The aim of the paper is to present the traditional technological flow utilised for goat milk yogurt obtained into a small range unit from Iași County, Romania and also to effectuate a physicochemical analyse for this product. From physicochemical analysis view point, the aims of the current paper were focused on the following parameters: fat content, protein content, acidity and dry matter content. At the end of the study we can affirm that the goat milk yogurt obtained fulfilled the technological demands and flow, being a traditionally made product. The quality of the product is a very good one, being recorded superior values for all the analysed physicochemical indicators which had superior values to those imposed by nowadays legislation.

Key words: goat milk yogurt, traditional technological flow, physicochemical properties

INTRODUCTION

Goats were among the first farm animals which were domesticated [20, 46]. Archaeological evidences indicated that they have been associated with mankind into a symbiotic relationship for more than 10,000 years [42].

Goat is considered to be the “poor man’s cow”. In the developing world, goat could fulfil the difference between malnourished and a healthy sustaining diet [33].

Goat (*Capra hircus*) is one of the main sources of milk and meat products for human consumption [24].

Goats are a very important component of livestock industry, having adaptability to harsh climates which make them suitable for landless and marginal farmers. The contribution of goats in supplying milk and milk products is high and it has significant role in rural economy and health [42].

In many countries, goat farming is the most important part, economically speaking, especially in Mediterranean and Middle East

areas. Goat farming is very well organized in countries such as: France, Italy, Spain and Greece [34].

Contribution of goats in supplying with milk and milk products is high and it has a very significant role in rural economy and for people’s health [42].

Many scientists focused on the functional properties of goat milk. It was concluded that, this milk have not only a high nutritional value but also have a therapeutic value and dietary characteristics [22].

Goat milk is a rich source of proteins, vitamins, minerals as well as many short and medium chain fatty acids [12].

Goat milk is quite important since it has high biological value and important nutritional qualities [9]. Its higher digestibility, alkalinity and dietary characteristics make it highly recommended for infant feeding and for adults who are sensitive or allergic to cow milk or have gastrointestinal disorders; therefore, it can be used as a healthy substitute for cow milk products [19, 28, 31 and 35]. Also the economic contribution and nutritional value of goat milk can be observed in developing countries, particularly in the Mediterranean

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region, Middle East, Eastern Europe, and South America [37].

Composition of goat milk varies according to different factors including diet, breed, individuals, parity, season, feeding management environmental conditions, locality, stage of lactation, and health status of udder [12, 36].

It is believed that milk products were incorporated into the human diet around 10,000–5000 BC, with the domestication of milk-producing animals (cows, sheep, and goats, as well as yaks, horses, buffalo, and camels) [32].

In the last decades demands of consumers' regarding food production know a considerably change [6].

Consumers more and more believe that foods contribute directly to their health [29, 30]. Today foods are not intended to only satisfy hunger and to provide necessary nutrients for humans but also to prevent nutrition-related diseases and improve physical and mental well-being of the consumers [27, 38]. Therefore, it improves the general health state and/or decreases the risk of illnesses [11].

Citing a World Bank Report from 2007, [23] affirm that “markets may also be characterized by new consumer demands due to changing lifestyles and increased knowledge of the benefits of a more diversified diet”.

Acid diet products are very popular in the world due to their pleasant sensorial characteristics, as well as due to potential for maintaining or improving consumers' health [7].

Consumption of dairy products in generally and acid dairy products in particular reached a new level in the last years, due to their benefit effects on humans' health [8, 41].

In the opinion of [25, 39] cited by [3] “yogurt is one of the most popular fermented dairy products widely consumed all over the world due to its sensorial and nutritional properties which are much sought after by consumers”. Yogurt is an important dairy product consumed worldwide and appreciated for its sensory characteristics.

“Yogurt is among the most common dairy products consumed around the world, and its sensory attributes have a large effect

on consumer acceptability” affirmation sustained by [1].

Yogurt has been known to mankind for over 6,000 years [31].

The word “yogurt” seems to be derived from the Turkish word “yoğurmak” [17, 26] or “jugurt” [43] which first appeared in the 8th century and means to thicken, coagulate, or curdle. The same author mentions that yogurt comes from the Middle East, where milk was scarce due to the desert environment.

Yogurt is obtained by the protosymbiotic or lactic fermentation of milk using live and active cultures of *Lactobacillus delbrueckii* spp. *bulgaricus* and *Streptococcus thermophilus* [3, 4, 13 and 16].

These micro-organisms of the lactic fermentation must be viable and to be present in the product finished in the minimum amount of 1×10^7 colonies by gram or millilitre. The hard fermentation takes between 6 and 23 hours, to reach the required acidity and sensorial characteristics [40].

As the popularity of yogurt products continues to grow, manufacturers are continuously investigating value-added ingredients such as prebiotics and probiotics to entice health-conscious consumers [1].

Even if yogurt is traditionally made with cow's milk, over the years, milk from other sources has been used to make yogurt. Goat's milk is particularly suitable for the production of yogurt, due to its composition, as well as providing numerous health benefits [45].

Therefore, fermented goat's milk products could represent a good opportunity to increase the supply of dairy products with greater nutritional value [5, 14, 15 and 37].

However, consumer's acceptance of goat yogurt is low due to its “goaty” flavour [44] resulting from high levels of caproic, caprylic, and capric fatty acids compared to other ruminant species [10, 18, 21].

The current paper focused on study of the traditional technological flow utilised for obtaining of goat milk yogurt into a small rage unit from Iași County, Romania.

Physicochemical analysis of goat milk yogurt targeted on the following parameters: fat, proteins, acidity and dry matter.

MATERIAL AND METHOD

The studied material was represented by goat milk yogurt obtained into a small rage unit from Iași County, Romania.

Physicochemical analyses were realized in according with the AOAC norms [2] and are very utilized and very well know, reason for not describing them in details (we will mention just the method's principle).

Physicochemical analyses were effectuated at UASVM from Iași.

For realizing the analyses were gathered 10 samples of goat milk yogurt, the samples were collected from products which belongs to the same batch, were obtained in similar conditions and are delivered in the same type of packaging. Preparation of samples for physical-chemical analyses is realized by homogenization and after that the samples are brought to temperature of +20°C.

Determination of fat content from goat milk yogurt was realised by Gerber acid-butyrometric method which is based on separation of fat from yogurt sample through centrifugation, after dissolving of proteins under the action of sulphuric acid (H₂SO₄) and isoamyl alcohol.

Determination of proteins from goat milk yogurt is realised by using Schültz method which is based on blocking of aminic groups from protein substances and release of carboxylic groups, which will be titre with a solution of NaOH (n=0.143).

Determination of goat milk yogurt acidity is realised by Thörner method which consist in neutralization of acids from a certain quantity of yogurt through titration with a solution of NaOH in the presence of phenolphthalein as indicator.

Determination of dry matter from goat milk yogurt is realised through oven drying method.

RESULTS AND DISCUSSIONS

Studied goat milk yogurt is very tasty and healthy, being obtained through a traditional technology.

The technological flows for obtaining goat milk yogurt through a traditional method have the following stages: milk reception (qualitative and quantitative) – pasteurization

at 85°C – cooling of milk at insemination temperature (47°C-48°C) – milk insemination with *Lactobacillus delbrueckii* spp. *bulgaricus* and *Streptococcus thermophilus* – packing of yogurt in jars – thermostatic preparation for 4-5 hours – labelling – final product.

Forwards we will detail each stage of the processing flow.

1. Pasteurization of goat milk. Just after goats milking, milk is collected carefully for being introduced into processing. Even if milking was realised as correct as possible and into the most hygienic conditions, for avoiding milk contamination, before pasteurization, milk must be cleaned. Removal of mechanical impurities is realised by a filtration through multi-layered gauze. After that, milk is transferred into a 50 litres stainless steel pot, for pasteurization (fig. 1).

Milk is boiled till reach the temperature of +85°C.



Fig. 1 Pasteurization of goat milk (original)

2. Cooling of milk at insemination temperature. When milk reached the pasteurization temperature it is subjected to an immediate cooling. Milk is transferred into cooling tank, where will be cooled till the optimal temperature of 47°C-48°C. The process is very important because this temperature is favourable for lactic bacteria. After cooling milk is subjected further to technological process or could be kept into cooling tank, till the moment in which will be used for processing.

3. Milk insemination. The processing flow of goat milk yogurt continues with adding of starter cultures. For the yogurt studied by us is utilised bacteria which belong to thermophile gender: *Lactobacillus delbrueckii* spp. *bulgaricus* and *Streptococcus thermophilus*. Starter culture is

prepared by mixing those two ferments with 500 ml boiled and cooled milk and after that is introduced in the total mass of milk; the dosage of ferments is the one for 50 l of milk. It must be very well stirred. Addition of those ferments will help yogurt coagulation, obtaining a compact one, with a homogenous mass, without agglomerations of fats or protein substances (fig. 2).



Fig. 2 Insemination of goat milk (original)

4. *Packing of yogurt in jars.* Before being filled jars are sterilized with hot water and dried at a temperature of 48°C. Each jar is carefully filled (fig. 3), after that being placed on a grill for being introduced at in thermo-starter. Packing of yogurt is realised in 380 ml glass jars (fig. 4).



Fig. 3 Packing yogurt into jars (original)



Fig. 4 Jars filled with yogurt (original)

5. *Thermostatic preparation.* After the jars are filled those ones are placed on the

thermo-starter grills, being placed one several rows (fig. 5). Here are kept at a temperature of 47°C-48°C for 4-5 hours. At the end of process, the jars with yogurt are individually checked. Those ones must have a compact structure; yogurt must not detach from the jar walls and not to eliminate whey. The jars with yogurt are removed from thermo-starter and are cooled; after that are placed into fridge and kept there at a constant temperature of 2°C-4°C.



Fig. 5 Fermentation of yogurt (original)

6. *Labelling of jars with yogurt.* On each jar with yogurt is sticks an individualised label. On this one are marked the following: product name, producer, address and telephone number, fabrication date, shelf life time, storage temperature and the ferments utilised for product obtaining. Labels are daily stamped with the date in which the product was obtained (fig. 6).



Fig. 6 Labelling of yogurt (original)

To effectuate the determinations, were subjected to analysis a number of 10 sampled of goat milk yogurt traditionally obtained. To present the product quality we aimed to determine the most important physicochemical parameters. The analyzed

indicators were: fat content, protein content, yogurt acidity and dry matter content. The limits imposed by the nowadays legislation for the physicochemical parameters above mentioned must be respected because justify the continuous monitoring need for keeping the quality of the final product. The obtained results (tab. 1) were compared with the firm's standard, appreciating the correspondence level between them.

Regarding fat content we obtained a mean value of $2.894 \pm 0.009\%$ (tab. 1 and fig. 7), in comparison with minimum 2.80% as it is stipulated in the standard.

The minimum value obtained by us was 2.86% and the maximum value was 2.95% (tab. 1).

Variation coefficient recorded a value of 0.966% which indicates a very homogeneity inside the analysed lot (tab. 1).

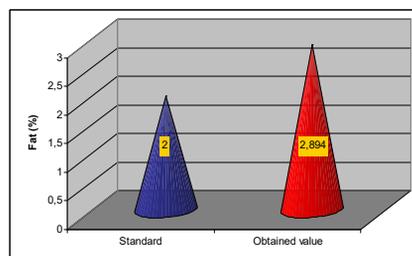


Fig. 7. Fat content (%) of the studied goat milk yogurt

Table 1 Physicochemical parameters of studied goat milk yogurt obtained through a traditional method

Physicochemical characteristic	Standard	Results (n=10)			
		Minimum	Maximum	$\bar{X} \pm s_{\bar{x}}$	V (%)
Fat (%)	2	2.86	2.95	2.894 ± 0.009	0.966
Protein (%)	min. 3	3.10	3.60	3.350 ± 0.120	0.340
Acidity ($^{\circ}$ T)	max. 145	142.00	144.80	143.59 ± 0.281	0.619
Dry matter (%)	min. 11	11.20	11.90	11.505 ± 0.072	1.991

Analysis effectuated on samples of goat milk yogurt enlightened the fact that value of protein content recorded a minimum value of 3.10% and a maximum one of 3.60%.

The calculated mean value was $3.350 \pm 0.120\%$ (tab. 1 and fig. 8), which was superior to standard which impose a value of minimum 3% for this indicator.

Value of variation coefficient was 0.340% which show the fact that also in this case the homogeneity of the analysed lot was a very good one (tab. 1).

Acidity of goat milk yogurt had values between 142.00° T (minimum) and 144.80° T (maximum), with an established mean value of $143.59 \pm 0.281^{\circ}$ T (tab. 1 and fig. 9).

The acidity was below the maximum value imposed by standard (max. 145° T).

Variation coefficient, in this case had the value of 0.619%, fact which highlight a very good homogeneity for the analysed product (tab. 1).

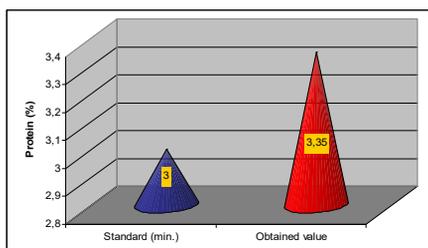


Fig. 8 Protein content (%) of the studied goat milk yogurt

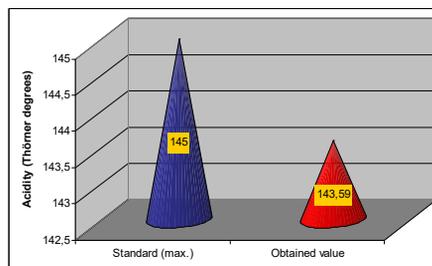


Fig. 9 Acidity ($^{\circ}$ T) of the studied goat milk yogurt

The last analysed parameter was represented by dry matter content of goat milk yogurt.

This indicator recorded a minimum value of 11.2% and a maximum one of 11.9% (tab. 1).

The calculated mean value for this parameter was $11.505 \pm 0.072\%$, value which is superior to the one imposed by standard (min. 11%) (tab. 1 and fig. 10).

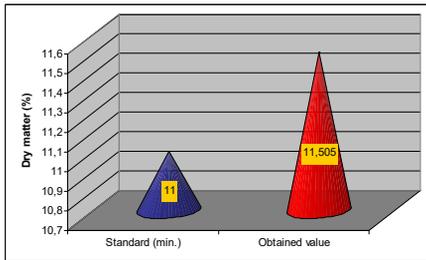


Fig. 10 Fat content (%) of the studied goat milk yogurt

The analysed character, also presented a very good homogeneity inside lot, variation coefficient reaching value of 1.991% (tab. 1).

CONCLUSIONS

Based on the effectuated study we can affirm that goat milk yogurt obtained into a small range unit from Iași County, Romania, fulfilled the technological demands and flow, being a traditionally made product.

The quality of the product is a very good one, being recorded superior values for all the analysed physicochemical indicators which had superior values to those imposed by nowadays legislation.

So we strongly advise the consumption of goat milk yogurt which was subjected to the current study.

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