DETERMINATION OF THE PHYSICO-CHEMICAL COMPOSITION OF WHEY

Zulfiya Ergasheva
Senior Lecturer,
Mechanical Engineering Department,
Tashkent State Technical University Islam Karimov,
Republic of Uzbekistan, Tashkent
E-mail: z.q.ergasheva@gmail.com

Javokhir Rasulov
Master's degree,
Islam Karimov Tashkent State Technical University
Republic of Uzbekistan, Tashkent

ОПРЕДЕЛЕНИЕ ФИЗИКО-ХИМИЧЕСКОГО СОСТАВА МОЛОЧНОЙ СЫВОРОТКИ

Эргашева Зульфия Кахрамановна
ст. преподаватель
машиностроительного факультета,
Ташкентского государственного технического университета
имени Ислама Каримова,
Республика Узбекистан, г. Ташкент

Расулов Жавохир
магистр,
Ташкентского государственного технического университета
имени Ислама Каримова
Республика Узбекистан, г. Ташкент

ABSTRACT

This article explores the study of sterilisation and the use of acoustic and electromagnetic methods for the treatment of reconstituted milk and milk whey.

АННОТАЦИЯ

В данной статье исследуются изучение стерилизации, а также использование акустические и электромагнитные методы обработки восстановленного молока и молочной сыворотки.

Keywords: pasteurisation, sterilisation, acoustics, ultrapasteurisation, electromagnetic irradiation, heat treatment, acoustic cavitation.

Ключевые слова: пастеризация, стерилизации, акустика, ультрапастеризация, электромагнитное облучение, термообработка, акустическая кавитация.

INTRODUCTION. Milk and dairy products occupy a significant part of the human diet. The high nutritional value of milk and dairy products lies in the fact that they contain substances necessary for the human body in optimally balanced proportions and in an easily digestible form [2].

At present, many different raw milk processing methods are used to produce quality and safe products: pasteurisation, sterilisation, ultra-pasteurisation as well as acoustic cavitation, ozone treatment, electromagnetic irradiation, etc., among which the reduction of bacterial contamination and preservation of the biological value of the product play a decisive role. The most common method for treating raw milk is pasteurisation and sterilisation, which ensure the safety of milk consumption.

LITERATURE REVIEW. However, these methods of milk treatment are energy-intensive and require a certain apparatus design and appropriate space. As an alternative to the above methods, acoustic and electromagnetic methods of treatment of recovered milk and milk serum are used in foreign practice. There is almost no information in the available sources of information about the effect of acoustic and electromagnetic radiation on the quality and safety of whole milk of different species of farm animals and about the possibility of producing dairy products containing treated milk using these methods, while preserving their biological value [1-3]. The Strategy for Science and Technology Development until 2025 emphasizes the need to use new technological methods for raw milk processing, in particular acoustic

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cavitation, which is an energy- and resource-saving technology [4].

In view of the above, the study of the effects of treating raw milk using new technological methods of exposure is a relevant scientific field.

The working hypothesis is based on the assumption that it is possible to use new innovative methods of impact - acoustic cavitation and lavinostreamer discharge - to treat raw milk in order to achieve the pasteurisation effect and its subsequent safe use in dairy products production.

THE MAIN PART

In recent years, goat and sheep milk and their products have been increasingly used on the domestic market in addition to cow's milk. There is an increase in the number of animals, targeted breeding work is carried out to improve animal productivity [5]. Imports of goats and sheep with high dairy productivity, whose milk is intended for the production of a variety of dairy products, primarily cheese, including elite, are being imported, which will significantly complement the market of Uzbekistan. At present, one of the most highly productive goat breeds in Uzbekistan and in the world is the Saaneni, and among sheep, the East Friesian.

However, the effects of ultrasound technology and lavistreamer discharge on the processing of whole milk from cows, sheep and goats to achieve the pasteurisation effect and further safe use of milk for dairy products have not been sufficiently studied

The results of a comprehensive assessment of the quality of raw milk obtained from different types of farm animals are shown in Table 1. It is shown that the mass fraction of fat in goat and sheep milk is 0.80% and 2.5% higher, respectively, than in cow milk (Table 1).

Table 1.

Physico-chemical composition of different farm animals

Physico-chemical indicator	Milk		
	Goat[3]	**Sheep[2]**	**Cow[1]**
Total nitrogen content, %	0,607±0,030	0,955±0,030	0,530±0,030
Mass fraction of protein, %	3,87±0,11	6,09±0,12	3,38±0,11
NBA content, %	0,0415±0,0060	0,0362±0,0060	0,0310±0,0060
SB content, %	1,11±0,03	1,92±0,03	0,86±0,03
Mass fraction of fat, %	4.3±0.05 *[1-2]	6,0±0,05	3,5±0,053-1;3-2*
Mass fraction of moisture, %	86,77±0,01	82,13±0,015	87,74±0,012
Mass fraction of lactose, %	4,40±0,02	4,94±0,01	5,07±0,01
Titratable acidity, ºT	20±0,02	24±0,012	17±0,14
Active acidity, pH	6,49±0,02	6,65±0,01	6,69±0,17
Density, kg/m^3	1,0290±0,15	1,0274±0,17	1,0278±0,17
Effective viscosity, Pa-s	1,8-10^{-3}	2,4-10^{-3}	1,8-10^{-3}
Dispersion of fat globules, microns	4,3±0,30	5,77±0,25	5,98±0,15
Alcohol sample, volume fraction of ethyl alcohol, %	can't handle 68% alcohol		withstands alcohol 80%

Note: *Hereinafter -*$^{*1-2}$ *P≥0.05;* $^{*3-2}$ *P≥0.05;* $^{*3-1}$ *P≤0.01-ratio between groups*

Sheep milk has been found to have fat globules, with a predominant size of less than 3.5 μm, whereas the size of fat globules in cow's milk varies from 0.92 to 15.75 μm (Figure 1).

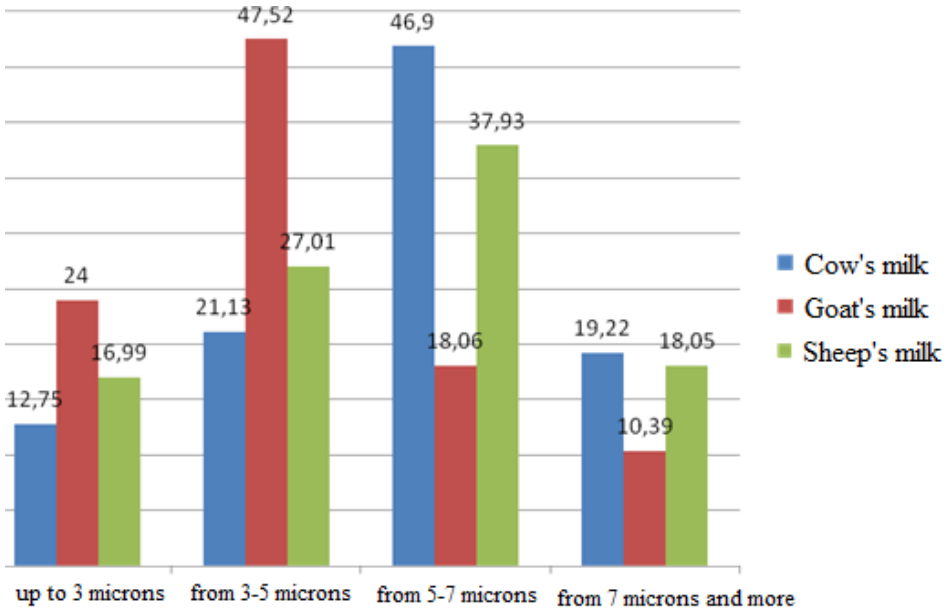

Figure 1. Diagram of fat globules distribution of cow's, goat's and sheep's milk, %.

The mass fraction of protein in sheep milk (Table 1) is almost 2 times higher compared to cow's and goat's milk, while the protein composition of sheep milk, which is characterised by NBA and SB indices, shows that sheep milk has 2.23 times more whey proteins compared to cow's milk.

The effective viscosity of sheep milk is 33% higher than that of cow's and goat's milk, which is due to the chemical composition of sheep milk (Table 1).

When assessing raw milk for heat tolerance according to the alcohol probe, it was found that sheep and goat milk do not tolerate the lowest-68% alcohol concentration, which indicates the low sensitivity of this quality indicator when accepting these types of milk and requires highly sensitive methods of assessment, such as a thermal test.

CONCLUSION. Thus, the obtained characteristics of physic-chemical, microbiological and organoleptic characteristics of cow, goat and sheep milk indicate that the quality of milk obtained from farm animals does not fully meet the requirements of TR TS 033/2013, which requires the use of new technological methods to adjust its quality at the stage of primary processing of milk in order to obtain products with given consumer properties and composition.

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