

Study of the Composition of Raw Milk and Physicochemical Composition of Water Used On Farms

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ABSTRACT: *The composition of raw cow was studied microbiologically and physicochemically. The number of microorganisms and the number of somatic cells were determined. Raw milk samples were tested for fat content. The tests were performed according to standard methods. The analyzes were conducted in 2019. The data obtained show an increase in the total number of microorganisms during the summer, and an increase in the number of somatic cells. The percentage of fat content decreases during the summer period in the analyzed samples of raw milk.*

KEYWORDS *Total number of microorganisms, somatic cells, fats, cow's milk*

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I. INTRODUCTION

Milk is a complex biological fluid that is obtained from the udder of a dairy animal and is used after the seventh day of the baby's birth. It has a complex composition that makes it a complete and indispensable food, as defined by BDS [1]. Milk has weak natural protection and spoils easily. The composition of the microflora of raw milk is very diverse and depends on the health of the animal and the cleanliness of the skin and udder during milking, the milking machines, the hygiene of the milker and that in the milking parlors, the water used for washing vessels. Crucial is the storage temperature, which inhibits the development of some and favors the development of other microorganisms. At a temperature of 20-37°C mainly streptococci and enterobacteria develop. At 5-15°C many lipolytic and proteolytic species develop, which slowly but surely degrade the quality of milk. The change in the microbial content of milk over time is determined by its initial contamination, the cooling regime and the duration of storage until its processing. Each phase of milk has a certain group of microorganisms [1,2]. There is a relationship between the age of the animal and the number of microorganisms, between the number of microorganisms and the ambient temperature. In a study [10], the total number of microorganisms in raw cow's milk was found to be highest in the 80,000 to 100,000 cfu / ml group during the summer.

Bacterial count in first and second lactation cattle is lower than in lactating third. Staphylococcus and Micrococcus species predominate in aseptically milked milk [2].

Based on the studies of a number of authors [5,6] that the quality of milk depends on the content of microorganisms in it, in the present study the fluctuations of the total number of microorganisms, the number of somatic cells and the fat content were observed. Monitoring the total number of microorganisms, somatic cells and fats in raw milk is a key aspect to ensure quality and raw milk. According to a study [12], the mandatory norms for the total microbial contamination of milk are specified in Ordinance № 2/2017, and for raw cow's milk the total number of microorganisms should not exceed 100,000 cfu / ml. A total number of somatic cells up to 400 000 cells / ml. The water sources should be monitored closely and paid more attention to, especially as regards the water quality parameters related to human health [14].

According to [13], the reliability of the obtained results is proved by interlaboratory comparisons in which one participates for proving competence by a certain method. Through such participation, laboratories can compare their results with similar laboratories, monitor their results over time, detect trends and take the necessary preventive or corrective action.

II. EXPERIMENT

Materials and methods:

Materials

The samples were tested by standard methods:

EN ISO 4833: 2013 Microbiology of food and feed. Horizontal method of enumeration of microorganisms. Colony counting technique at 300C [8].

EN ISO 13366-1 Milk. Enumeration of somatic cells. Part 1:Microscopic method (Reference method) [7].

ISO 2446 Milk - determination of fat content. Routine method (method of Gerber) [9].

III. RESULTS AND DISCUSSION

There are various factors for inoculating milk with microorganisms. According to [5], the sources of contamination of milk are very different. The most important of these are the udder and skin of the dairy animal, the litter of the animals, the milking equipment and milking installations, the work clothes of the milkers, the fodder, the water and others. Additional contamination of milk with microorganisms is harmful both for its processing and for the quality of the obtained dairy products. According to Munich et al. [4] The presence of saprophytic micro-organisms in raw milk indicates the level of hygiene during its production, the cleanliness of the milking parlor, the storage and transport conditions. Temperature is a factor that affects bacterial growth in raw milk. In a study [10] it turned out that the dairy season in the country is the factors that influence the total number of microorganisms in raw cow's milk. Compared with the summer season, for the winter season the number of microorganisms is lower.

Parameters of water used for clean of apparatus equipment is pH -7.3, nitrite (0.50mg/l), nitrate (50mg/l), Mn (50µg/l), Al (200 µg/l) and conductivity (2000µS/cm). They were analyzed using the standard water analysis methods [14]. The fulfillment of the requirements of this ordinance must not allow direct or indirect deterioration of the existing quality of drinking water according to indicators related to health, as well as increase of the pollution of the natural waters, intended for drinking and household water supply.

Table 1 presents the data obtained from the 56 raw milk samples tested. Table 1 shows the minimum and maximum value obtained for the analysis period. The lowest value obtained for the total number of microorganisms 66,000 cfu / ml in February and the highest in July 98,000 cfu / ml. In a study [11], the lowest values were $7.2 \cdot 10^5$ cfu / ml for buffalo and $9.9 \cdot 10^5$ cfu / ml for goat's milk. From the obtained results a satisfactory microbial contamination of the examined milk samples is established, which testifies to the good sanitary hygienic condition of the milk production and the adequate application of the refrigeration treatment of the milk. The higher total microbial contamination of goat's, sheep's and buffalo's milk compared to cow's milk is due to the specific breeding and milking conditions of the animals [11].

Spore [12] determined that the fat content of the tested samples was $3.5\% \pm 0.1$ for the month of June and corresponded to the norms for fat content in raw cow's milk.

In the study, the fat content varied from 3.2% in June to 4.1% in January. The lowest fat content is in June. The highest of the values obtained on this indicator in January averaged $3.6 \pm 0.2\%$. Then again in June, a period during which the cattle are on free grazing, and in combination with the high temperature, the fat content is the lowest.

According to a study [12], the average content of somatic cells is again highest during the summer period, when the total number of microorganisms is highest.

Table 1. Total number of microorganisms in raw milk (n = 56)

Samples	Minimum number of OBM cfu / ml	Maximum number of OBM cfu / ml	Average value OBM cfu / ml
Raw cow milk	66 000	98 000	85 300

Table 2. Fat content in raw cow's milk samples (n = 56)

Samples	Fat (x ± sd) (%)	Minimum obtained value of fat (%)	Maximum obtained value of fat (%)
Raw cow milk			
January	3,8±0,2	3,6	4,1
June	3,5±0,1	3,2	3,8
October	3,6±0,2	3,4	3,9

Table 3. Average number of somatic cells (n = 56)

period	Somatic cells / ml
January	199 000
June	385 000
October	305 803

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