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RESEARCHES ON PHYSICO-CHEMICAL AND MICROBIOLOGICAL CHARACTERISTICS OF SHEEP AND COW MILK FROM CRISTIAN FARM, ROMANIA

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Abstract: This study was conducted over a period of three month in the Cristian farm, Sibiu. For the physical, chemical and microbiological analyzes were taken a number of 15 samples per month. From physico-chemical point of view the content evolution of fat, not fat solid substance, density, protein, freezing point, temperature, lactose, conductivity, pH, water addition was followed. Samples were analyzed using the milk analyzer Ekomilk Total of the Research Centre in Biotechnology and Microbiology of the "Lucian Blaga" University. The microbiological contamination of milk was done by determining the total number of bacteria and coliform bacteria. From microbiological point of view it was observed that these conditions are largely met, but a more rigorous control on the cleanliness of utensils and of the staff is required.

Keywords: sheep milk, cow milk, coliform bacteria, physico-chemical indicators

INTRODUCTION

Studies on the nutritional and biological values of food, their rational use by living and working groups of people, criteria and methods to evaluate food,

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to prevent diseases caused by irrational, unhealthy or polluted eating, as well as, to establish appropriate measures to prevent and to control, are the subject of food hygiene (Muşat et al.,2007; Georgescu, 2003; Iancu, 2010). It is known that the relationship between man and food involves several main issues. Thus to fulfill its role as a provider of nutrients necessary to develop the activity, to build and to repair the body, the food must be nutritional (nutrient aspect), salubrious (healthy aspect), appealing and pleasant (olfactory aspect), (Ioannis et al., 2005; Oprean et al., 2010; Ozge et al., 2009).

Each of these characteristics can be, to a certain extent, adversely affected by the harmful activity of contaminated micro-organisms present in the food (Iancu, 2010, Kongo et al., 2006).

The evolution of human civilization, the rise of living standards, the industrial processing of food, has led to an increased demand of the consumers on the quality and the continuous improvement of this. As a matter of course, the concentration of production has increased the possibilities to contaminate the food and therefore the risks of spoilt products and sick consumers (Oprean et al., 2009; Oprean et al., 2010; Masoud et al., 2010). Preventing and controlling these requires the application of strict hygiene measures, from the raw material up to the moment of consumption (Brooks et al., 2008).

MATERIALS AND METHODS

Determination of the number of live microorganisms (TNG)

The total number of microorganisms (TNG) represents a health indicator and provides us with data on the state of the product contamination or on the examined objective. This indicator refers only to the living micro-organisms from the sample which is subject to control.

Due to the technology that is normally applied to determine this parametre, it includes only aerobe microorganisms, mostly bacteria. The method to determinate the total number of micro-organisms is based on the incorporation of a certain amount of the sample to be investigated, in a nutritional medium specific to the growth of bacteria, namely yeasts and moulds (nutrient broth agar, malt wort agar) in Petri boards in which, after a suitable temperature of incubation, from each organism a visible colony will be developed.

Determination of the presence of coliform bacteria

Through the bacteriological analysis of some fluids the determination of another health indicator is required- coliform bacteria, which are bacillus or gram-negative cocobacillus (G-) which, cultivated at 37 ° C in an appropriate medium, ferment lactose with the gas production. The group of coliform bacteria mainly contains the species from the *Escherichia*, *Enterobacter*, *Klebsiella* genus. They represent a health indicator of great significance, showing on the one hand the conditions of achieving and handling the products, and on the other the effectiveness of the thermic treatments applied to them. Highlighting is based on their property to ferment lactose with the gas production. For this purpose, culture mediums are used, containing lactose and inhibitory substances for the flora with which this cohabits. The determination of the probable number of coliform bacteria per 100 cm^3 sample is done using statistical tables based on the amount of analyzed sample, taking into account the confirmed vials and tubes (SR 8823/2002).

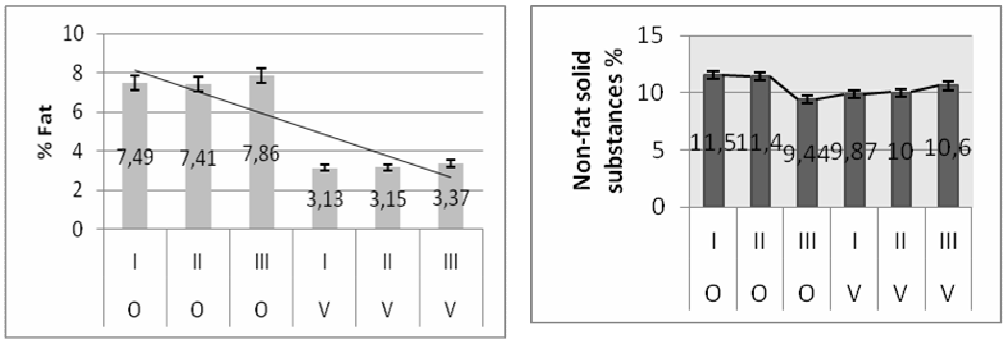
RESULTS AND DISCUSSIONS

For the physico-chemical analyzes have been taken a number of 15 samples per month from the farm Cristian for a period of three months. The samples were analyzed using the milk analyzer Ekomilk Total of the Research Centre in Biotechnology and Microbiology of "Lucian Blaga" University. Sampling was carried out in 50 ml sterile tubes, labelled and transported at 4 ° C temperature in the laboratory. The sampling procedure was followed by an individual statement that included the date of collection, the amount collected as well as the analyzed physico-chemical indices: fat, non fat solid substance, density, protein, freezing point, temperature, lactose, conductivity, pH, addition of water.

The physico-chemical analysis of the sheep (o) and cow (v) milk led to the creation of a profile specific to Cristian farm. Following the fat content resulted during the three monitored months it can be noticed that the percentage of sheep milk is 150% higher than the cow milk. The values for the sheep milk range from 7.49 to 7.86% fat and for the cow milk the values start from 3.13% and they reach 3.37%. The fact that the values are increasing is due to the change of the animal's food. When spring comes their diet becomes more varied, enriched, and this can be seen in Figure 1a.

The content of non-fat substance is close for both types of milk investigated in accordance with Figure 1b. Their values range from 9.44 for the sheep milk in the third month and 11.5 for the cow milk in the first month. The cow

milk is between 9.7 and 10.6 percentage units showing insignificant variations.



a b

Figure 1. The fat (a) and non-fat solid substance (b) content of the sheep (O) and cow (V) milk expressed as a percentage, during three months of monitoring, collected from Cristian farm

Figure 2 shows the density of sheep and cow milk, the values of this parameter ranging between 31.2 and 37%. In this case the density of the sheep milk is close to the density of the cow milk, clear differences being visible only in the third month of monitoring. It is thus obvious that the density of the cow milk increases by 20% compared to the density of the sheep milk.

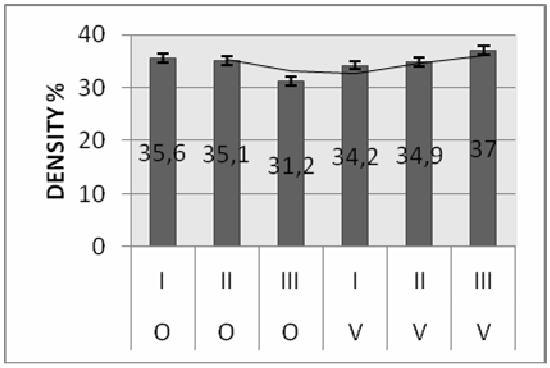


Figure 2. The density of the sheep (O) and cow (V) milk expressed as a percentage, during the three months of monitoring, collected from Cristian farm

The content of protein (figure 3) characterizes milk in general, its values ranging between 4.28 and 6.12 in the case of sheep milk and between 3.38 and 3.99 in the case of cow milk. These proteins affect both the stability of milk and the cells activity from these. The proteins have a high nutritional value due to the fact that they have essential amino acids in their

composition and certain protein fractions form enzymes and antibodies with catalytic activity. Both types of milk, the sheep and the cows, are considered casein milk, the rate between casein and whey protein being of 4:1.

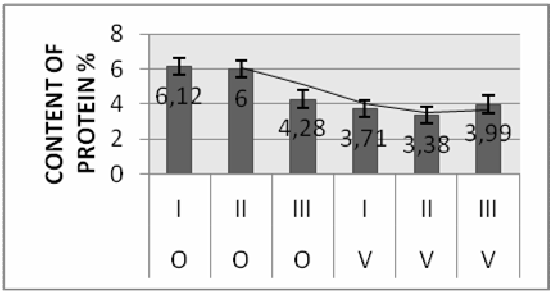


Figure 3.The content of protein of the sheep (O) and cow (V) milk expressed as percentage, during the three months of monitoring, collected from Cristian farm

As it is shown in Figure 4, the freezing point of the sheep and cow milk does not drop below 51 but does not exceed 68. Normality within the existing limits so that this indicator remains required standards. The existing limits situate in normality so, this indicator remains in required standards.

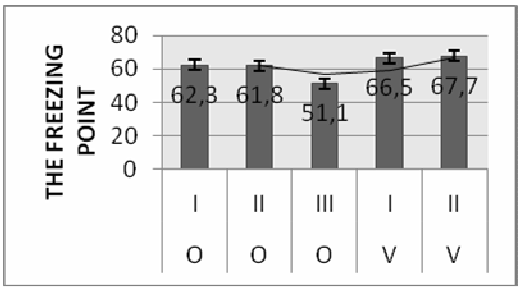


Figure 4.The freezing point of the sheep (O) and cow (V) milk during the three months of monitoring, collected from Cristian farm

The content of lactose of the sheep milk is 3% lower compared to the cow milk (Figure 5). In literature the value of lactose is around 4.5 for the sheep milk and the results of the three months of monitoring are between 4.43 and 4.5. The average composition of the cow milk places lactose in a range from

4.7 to 4.9%. According to Figure 6, the lactose content of the cow milk during the three months studied, is up to 5.83%.

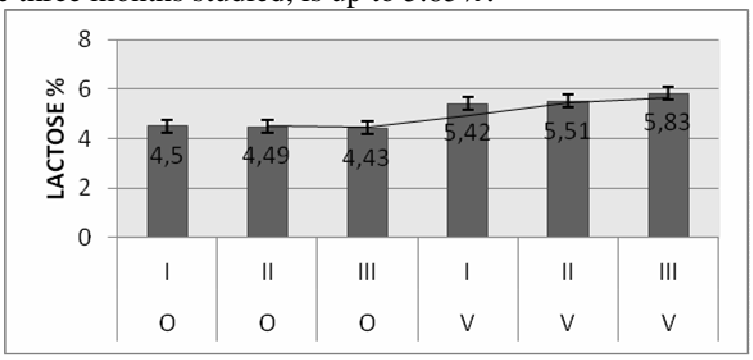
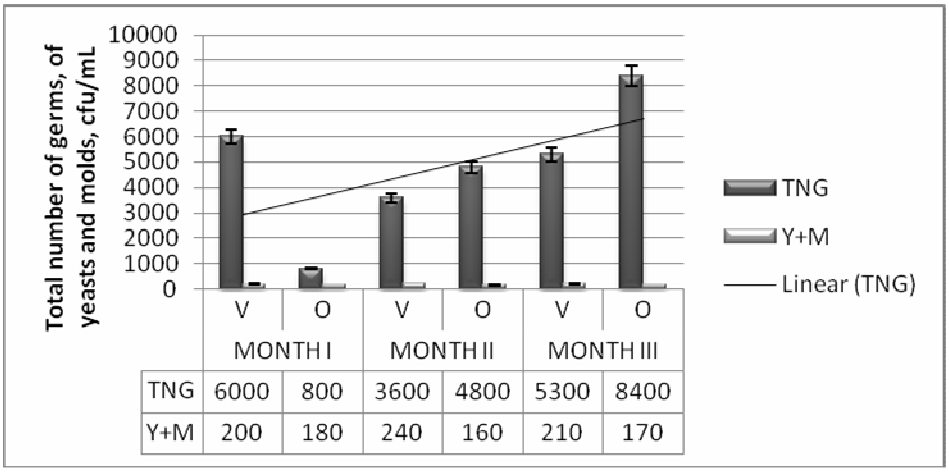


Figure 5. The content of lactose of the sheep (O) and cow (V) milk, expressed as percentage during the three months of monitoring, collected from Cristian farm

The milk composition can not be strictly defined as a percentage as it depends on many factors such as: the breed of the animal species, lactation, source of food, hygiene and care, etc. The total number of germs, yeasts and molds affects the microbiological quality of the milk. Figure 6 shows that the total number of germs exceeds 8400UFC/cm^3 for the sheep milk and 5300UFC/mL for the cow milk. Higher values were found in the third month of monitoring, a natural thing correlated with the increase of the ambient temperature which favours its development. Figure 7 shows that coliform bacteria vary between 0.3 and 0.8 / ml, values admitted by the required standards.



	V	O	V	O	V	O
	MONTH I		MONTH II		MONTH III	
TNG	6000	800	3600	4800	5300	8400
Y+M	200	180	240	160	210	170

Figure 6. The monthly average total number of germs, of yeasts and molds identified in the milk of sheeps (O) and cows (V), expressed as cfu / mL during the three months of monitoring

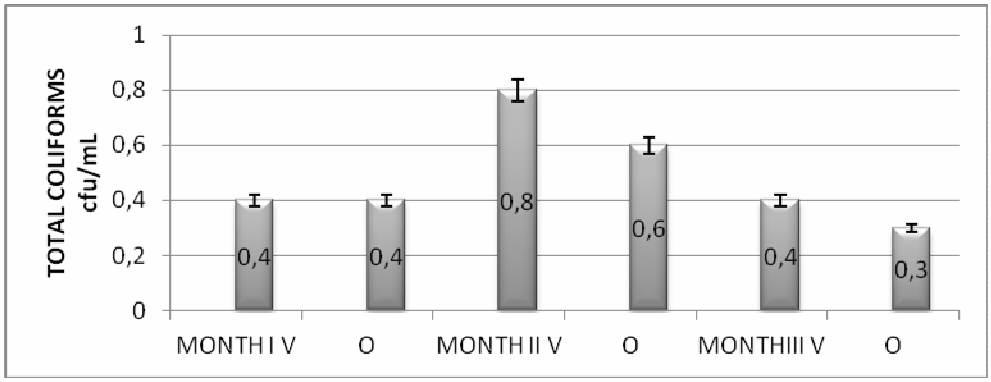


Figure 7. The monthly average of total coliforms identified in the sheep (O) and cow (V) milk expressed as cfu / mL, in the three months of monitoring

CONCLUSIONS

The quality and the hygiene of milk depend on a number of factors related to the health of the animals, milking hygienic conditions, sanitary conditions of transport, handling, storage, and the cleanliness of staff.
From microbiological point of view it was observed that these conditions are largely met, but a more rigorous control on the cleanliness of utensils and of the staff is required.
Under qualitative report the cow and sheep milk corresponds both in terms of chemical composition and microbiological point of view.
From hygienic point of view, the milk that was studied presents both physico-chemical and microbiological characteristics which fit into the existing standards.

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