

STUDY REGARDING THE INFLUENCE OF SANITIZATION METHODS ON SHEEP MILK BACTERIOLOGICAL QUALITY

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Abstract

Products obtained from sheep's milk benefits from a high demand on the European market and Romanian market, too. The research took place in 2013-2014, in four farms from the north-west of Romania (Husasău de Tinca, Carei, Nușfalău and Oradea), including 432 lactating sheep Țurcană sheep. Taking into account the fact that there are different factors influencing the quality and quantity of milk products, the objective of this study was to evaluate the impact of sanitization method on the quality of milk production. There were made several controls to determine the TNG/cm² in the samples taken from the hands of milker, from the animals' udder and from the buckets used for milking. Washing and specific disinfection determined the most drastic reduction of bacteria in milk. Proper sanitization can give milk qualitative properties framed in EU standards.

Keywords: sheep milk, disinfection, total number of germs

INTRODUCTION

The need to increase milk production in sheep, lies in the very high biological and economic value of this kind of milk.

In our country sheep milk production presents great importance, the products that are made from it are very popular. Among the factors that motivate exploitation of sheep for milk production are higher dry matter content and high efficiency for processing into cheese .

Since most milk production is converted into dairy, milk quality are examined in terms of capability of being processed (Bencini R. and Pulina G., 1997) .

For proper processing milk must be accepted within the microbiological quality limits, although most of the times, this condition is not met (Pulin 1990).

Sheep milk production depends on a number of factors. Factors determining milk production (Figure 1.) in terms of quantity and quality can be divided into: genetic factors , environmental factors, internal and external environmental factors .

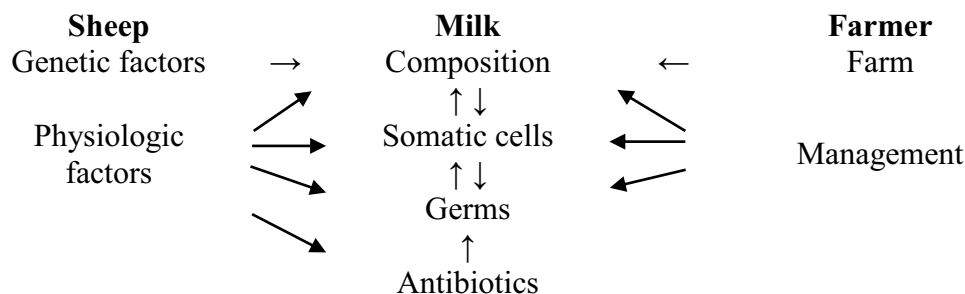


Fig. 1. The factors that affect the quality and quantity of sheep milk

Research on sheep milk quality and the influence of genetic and environmental factors on it began in France in 1962, when mechanical milking of sheep was initiated. This management of sheep exploitation was extended to most European countries (Purroy Unanua, 1986) causing an intense development of dairy industry from sheep milk. In this context, research regarding optimization of growth technologies and achieving a specific quality of milk, takes an important place in the scientific field of sheep exploitation (Pădeanu I., 2000).

Approximately 25% of the world's land surface supports about 20 million pastoral households or about 180–200 million people (Degen A.A., 2007).

The production of milk from sheep depends on a number of factors (Teușdea V., 2002). Factors determining milk production in terms of quantity and quality can be divided into: genetic factors, internal and external environmental factors (Iurcă I., C. M. Răducu, 2005; Man C., 2002; Silanikove N. et al, 2010). The quality of the milk for cheese making depends essentially on its physical and chemical composition and on hygienic and sanitary factors (bacterial count, somatic cells count, etc.) (Pirisi A. et al, 2007)

The objective of this study was to evaluate the impact of sanitization method (of the milker's hands, animals' udder, milking vessels) on the quality of milk production, evaluated in terms of total number of germs/ ml milk (Ekici K. et al, 2004; Sabău D., O. Rotaru, 2006).

MATERIAL AND METHODS

The study was conducted in the north-west of Romania, during April 2013 - June 2014, in four sheep farms from the localities of: Husasău Tinca (Bihor County), Carei (Satu Mare County), Nușfalău (Sălaj County) and Oradea (Bihor County). The animal biological material was formed of nine groups of twelve sheep (Țurcană breed), for each of the four farms. The

groups of twelve animals were formed at random from herds of some private farms that had at least 50 sheep.

Each sheep was marked so all subsequent operations could be executed on the same animals. Rehearsals necessary for the adopted experimental type resulted in two ways:

- by repeating a specific work/ operation of sanitizing or of control for its effectiveness three times in a row/ group of animals;
- by performing laboratory analyzes of TNG (total number of germs) in at least three repetitions of the average sample.

Since sanitation exams were conducted in four farms from different locations, there was used a total of 432 lactating sheep. (12x4x3x3). Bacteriological control consisted in determining TNG/cm² in the samples taken from the hands of milker, from the animals' udder and from the vessels used for milking.

Arrangements for sanitizing were done in three ways:

- V_m - assumed bacterial sampling from milker's hands, animals' udder, vessels and milk, under the usual conditions of the farm;
- V_{e1} - was achieved by washing milker's hands, animals' udder, milking vessels with warm water and toweling washed objectives or dry the vessels;
- V_{e2} - specific disinfection involved the use of Confidence solution 4% for udder disinfection, Laval solution and drying for milking vessels and antibacterial soap for washing hands and wiping them with disposable towel.

The statistical methods used in the calculation and interpretation of the results were based on Duncan test.

In the experiments for determinating TNG on milker's hands, on animals' udder and milking buckets, using various sanitization methods, the bi-factorial method was used in blocks or groups of samples performed in three repetitions (Cucu I.G. et al., 2004; Ardelean et al., 2005).

In order to highlight links between simple combinations of experimental factors, there were calculated simple correlation coefficients for all combinations between the sanitization variants and the three disinfected objective in terms of their effect on milk TNG. The significance of the results was given to P5% and P1%.

RESULTS AND DISCUSSION

Regarding the influence the sanitation of TNG on milker's hands, data in Table 1 reveal that both the method of cleaning and location had significant effect on TNG hands.

Table 1

The influence of the manner of sanitization and of the location on the total number of germs (TNG) found on the hands of the milker

Nr. crt.	Disinfected objective Location	NTG (thousands /cm ²)							
		V _m - No sanitization		V _{e1} - washing with water		V _{e2} -washing + specific disinfection		Location average	
1	Husasău de Tinca	328,5*	b	193,3	e	4,4	h	175,4	A
2	Carei	320,8	b	173,9	f	3,6	h	166,1	B
3	Nuşfalău	358,6	a	212,6	d	6,2	h	192,5	C
4	Oradea	290,0	c	154,6	g	3,3	h	149,3	D
Average for sanitization method		324,5	M	183,6	N	4,4	P		

DS5%: to compare two averages for location = 8.2 – 8.9 TNG (thousands/cm²)

to compare two averages for sanitization method = 9.5 – 10.0 TNG (thousands/cm²)

to compare two averages location x sanitization method = 16.5 – 19.3 TNG (thousands/cm²)

NOTE: the difference between any two values followed by at least a common letter is not significant for P5%.

It is noted that the largest number of germs on hands is registered V_m version (no sanitization), regardless of location. Washing with water (V_{e1}) provides a reduction by half of TNG, but average of this variation remains high and very high (183,600/cm²). The results are statistically significant to V_m (324,500/cm²) and to V_{e2} (4400/cm²).

Most spectacular results are obtained in all four places of experimentation, for V_{e2} version – washing + specific disinfection – when the number of germs on milker's hands is on average a hundred times smaller than in other versions.

Data from Table 1 reveals that there are significant differences between experimental localities regarding TNG on milker's hands. It is obvious that these differences are the result of how well the sanitization was done, since the average of the locality was mainly influenced by sanitized version and much less by no sanitized version, that had about the same value (about 300,000 TNG/cm²) in all settlements.

It seems, according to this reasoning that the best hygiene sanitization of milker's hands was carried out in Oradea, and the weakest in Nuşfalău. Differences between these extremes are significant (TNG 192,500/cm² - 143,500 TNG/cm²). The other two farms have values of TNG/hands intermediate between the two extremes mentioned above, but the differences are significant.

Analysis of the data in Table 1 regarding the effect sanitization methods and localities on TNG on milker's hands highlights the fact that

there were significant differences between localities only for the versions without sanitization or washing with water. For wash + specific disinfection all localities have had the same results; no significant differences between them.

Table 2 illustrates how sanitization influences TNG on the animals' udder. Unlike previously analyzed data, TNG from the udder proved to be strictly dependent on sanitization method. This means that within each sanitization method, there were no significant differences between localities.

Analyzing the significance of the difference between the sanitization methods, it can be noted that there are 247,000 TNG/cm² in the version without cleaning the udder V_m. Simply washing with water reduced four times TNG, while washing + disinfection has resulted in reducing fifty times TNG on udder.

It is obvious that any sanitization method brings gains in reducing TNG/udder, but by far the best cleaning is done Ve2 version.

Table 2

The influence of sanitization method and of the location on the total number of germs (TNG) found on the udder

Nr. crt.	Location	Disinfected objective	NTG (thousands /cm ²)						
			V _m - No sanitization		V _{e1} - washing with water		V _{e2} -washing + specific disinfection		Location average
1	Husasău de Tinca		246,3*	a	65,9	b	5,4	c	105,9 AB
2	Carei		242,7	a	50,0	b	4,6	c	99,1 B
3	Nuşfalău		281,0	a	79,5	b	5,9	c	122,1 C
4	Oradea		217,9	a	44,4	b	4,4	c	88,9 D
Average for sanitization method			247,0	M	59,9	N	5,1	P	

DS5%: to compare two averages for location = 20.6 – 22.3 TNG (thousands/cm²)

to compare two averages for sanitization method = 23.8 – 25.0 TNG (thousands/cm²)

to compare two averages location x sanitization method = 41.2 – 48.2 TNG (thousands/cm²)

NOTE: the difference between any two values followed by at least a common letter is not significant for P5%.

Analysis of locations average of TNG/animals' udder reveals what was said earlier about this character: between localities there are only a few cases of significant differences. In particular, localities Husasău of Tinca , Oradea and Carei have the same average of TNG on animal udder whatever the sanitization method is. Just Nuşfalău has significant difference from the others, suggesting that the sanitization has been made more superficial. This statement is supported by the fact that TNG on milker's hand had the highest values at the holding of Nuşfalău .

In all localities, the best option of sanitization is washing + disinfection using specific solution (Ve2 method), which provides a

significant reduction in the TNG on udder than any of the other two sanitization methods considered (V_m and V_{e1}).

Table 3

The influence of the sanitization method and of the location on the total number of germs (TNG) found on the milk buckets

Nr. crt.	Disinfected objective Location	NTG (thousands /cm ²)							
		V_m - No sanitization		V_{e1} - washing with water		V_{e2} - washing + specific disinfection		Location average	
1	Husasău de Tinca	201,3*	b	53,6	c	3,7	d	86,2	B
2	Carei	220,6	a	58,9	c	4,3	d	94,6	A
3	Nuşfalău	194,0	b	46,3	c	3,1	d	81,1	AB
4	Oradea	183,2	b	44,8	c	2,4	d	76,8	B
	Average for sanitization method	199,8	M	50,9	N	3,4	P		

DS5%: to compare two averages for location = 15.4 – 15.8 TNG (thousands/cm²)

to compare two averages for sanitization method = 16,2 – 16,5 TNG (thousands/cm²)

to compare two averages location x sanitization method = 20.8 – 22.6 TNG (thousands/cm²)

NOTE: the difference between any two values followed by at least a common letter is not significant for P5%.

Sanitization methods have significantly influenced the TNG on the milking buckets. As in the previous case, the mere washing with water leads to a reduction of the TNG four times on the buckets, and washing + disinfection with specific solution reduces TNG about fifty times. Although both methods of sanitization are significantly better than the version without sanitation, by far the third method (washing + disinfection with specific solution) gives the best results. The differences are significant from the other two methods of sanitization.

Farms have influenced very little the TNG on buckets. Three farms showed statistically not differentiated results between them on TNG/buckets wherever the sanitization method. This time, it appears that sanitization of buckets was made more superficial in Carei holding. This holding has the highest value of TNG/bucket, significantly different from the other three locations.

According to the data of Table 3, in all farms, washing + disinfection gave the best results, which is why we recommend be applied it generally to all sheep farms.

It is important to keep in mind that regardless of statistical significance or insignificance between sanitization methods, considering TNG in milk after certain hygiene works should be made taking into account EU standards (Şteţca Gh. et al., 2006; Taftă V., 2001).

Influence of disinfected objective on TNG from milk highlights that far, the worst effect is represented by milking vessels. It is evident, therefore,

that washing all objectives with water or with water + specific disinfection will provide milk that respects EU standards (Directive CE 91/180; Directive EEC/92/46 – 1992).

It is obvious from these data that sanitization by washing + specific disinfection applied to milker's hands, to milking vessels and to animals' udder provides in all localities lowest TNG in milk, well below the EU standards. Based on these findings we recommend this type of sanitization for all sheep farms.

The explanation of such results is quite logical taking into account the fact that in the practice of sheep farms even if there is no sanitization of animals' udder or milker's hands, vessels are still minimally disinfected (rinsing thereof with water after use). It is obvious that our recommendations will dwell mainly on sanitizing milker's hands and animals' udder, but not omitting milking vessel.

CONCLUSIONS

Simple hand washing with warm water provides a significant decrease in TNG, but it is far from the optimal solution to eliminate germs on milker's hands.

There is a need of very thorough training of milker on how to clean their hands, no matter how simple or complex that may be, so their efficiency is maximized.

We recommend applying washing and disinfection of hands before milking operation. Such a procedure will ensure a minimum of germs transfer from milker's hands to milk.

All three methods of sanitization (no sanitization, washing with water, washing with water + specific disinfection) are significantly correlated or significantly distinct with two disinfected objectives (milker's hand and animals' udder).

The reason why there is no significant correlations between methods of sanitization and milking buckets is explained by the fact that buckets are still minimally cleaned, while this minimal sanitation is absent for the udder and hands. This is understandable, given the large number of sheep that need to be milked.

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