Journal of Agricultural Sciences (Belgrade)
Vol. 68, No. 1, 2023
Pages 105-119

https://doi.org/10.2298/JAS2301105H
UDC: 637.12.056(497.11)
Original scientific paper

THE IMPROVEMENT OF THE BODY AND UDDER HYGIENE INFLUENCE ON THE MILK SAFETY AND COMPOSITION ON SMALL DAIRY FARMS IN SERBIA

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Abstract: The hygienic condition of dairy cows and their udders in 128 small household farms in different regions of Serbia, producing mostly milk, having 5–15 cows, a milk cooler and at least one milking machine, was evaluated by the following indicators: 1. general assessment of body cleanliness, 2. visual inspection of teats and udder base, and 3. maintenance of udder cleanliness, rated on a scale of 0 and 1 or 1 to 5. The samples were taken at each visit to the farm after cooling and tested for milk protein and fat content, somatic cell count (SCC) and the total number of microorganisms (TNM). The milk fat content was determined by the Gerber method, the protein content by the Kjeldahl method, the TNM according to the ISO 4833-1:2013 method and the SCC using Fossomatic TM. The IBM SPSS program was used for statistical data processing. Capacity, housing system, breed, milking system, number of cows, and capacity occupancy mostly had a very significant or significant impact on hygiene parameters, protein and fat content, SCC and TNM in milk. The hygiene parameters showed a continuous trend of improvement in relation to the visits. TNM mean scores increased after each visit, with significant differences between visits ($F=9.63$, $P<0.0001$). SCC scores varied very significantly between visits ($F=5.17$, $P<0.0001$). The number of visits tended to show a significant influence on the milk fat rate ($F=2.221$; $P<0.1$), but no influence on the milk protein rate ($P=0.480$; $F=0.901$).

Key words: improvement, body, udder, hygiene, milk, safety, composition, small dairy farms.

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Introduction

Milk production is an important financial resource for the survival and life of small farmers and their families. Today, it is increasingly important for them to produce milk and dairy products that meet food safety standards and to take advantage of the growing demand for their products.

Therefore, research often examines the relationship between the hygiene parameters of the farm, the cows and the milkers with the hygiene and milk composition. Success in milk production and processing practically depends on the adequate implementation of hygiene measures before and during milking and the procedures with the milk immediately after milking (Tamime, 2009; Oumer et al., 2017; Berge and Baars, 2020). These areas are closely related and are particularly evident in cows on small and medium-sized family farms.

The literature indicates that a clean cow body is an important factor in obtaining and maintaining milk quality (Schreiner and Ruegg, 2002; Sant'anna and da Costa, 2011; Robles et al., 2020). When cows lie on dirty bedding, feces, urine, soiled mats, and feed stick to the cow's body. During milking, this muck from the cow's body may easily get into the milking machines and milk. Regular removal of bedding and daily care of the cow's body may reduce the contamination of the cow's body and thus the milk contamination, especially on the parts of the body that are important for milking hygiene: hindquarters, udder, teats, abdomen, groin and extremities. A new mat should be added daily to keep the lying area clean and dry (Hristov, 2002; Relić and Hristov, 2016).

Maintaining animal health is extremely important for hygienic milk production (Schukken et al., 2003; Malik et al., 2018), whereby special attention should be paid to the occurrence of udder infections that lead to contamination of milk through the teats, and gastrointestinal infections increase the contamination of teat surfaces.

Material and Methods

During the study, the hygienic condition of dairy cows and their udders on farms was evaluated using a defined questionnaire, and sampled milk was tested for protein and milk fat content, SCC and the total number of microorganisms (TNM). On-farm examinations were performed three to six times, depending on whether on-farm hygiene measures needed to be corrected. The assessment and analysis of the situation were carried out on 128 small farms with free or tied rearing in different regions of Serbia. The selection of farms was made by the advisers of the Agricultural Advisory and Expert Services (AAES) of Požarevac, Jagodina, Kragujevac, Kruševac, Negotin, Niš, Prokuplje, Leskovac, Vranje and Pirot. The prerequisite was that the farmers are predominantly engaged in milk production and possess 5–15 cows, a milk cooler tank and at least one mechanical milking machine. The structure of the questionnaire was defined based on the methods of Kurwijila (2006), Cook and Reinemann (2007), Atasever et al. (2012), De Vries et al. (2012), and Relić and Hristov (2016), with the necessary modifications for a more detailed overview for the assessment of hygiene of cows, milking units as well as the procedures during milking. The questions corresponded to indicators and were rated on a scale of 0 and 1 or 1 to 5 (1 – poor, 2 – sufficient, 3 – good, 4 – very good and 5 – excellent). Based on the analysis of the obtained results, recommendations for correcting the hygienic procedures in milking were defined and agreed with the farmers. Questions 1–3 of the questionnaire were related to: 1. general assessment of body cleanliness, 2. visual inspection of teats and udder base for soiling and 3. maintaining of teat cleanliness visually or by using wet wipes or cotton wool.

For the application of the proposed corrective hygiene measures to improve hygienic conditions before, during and after milking of cows, farmers were trained by advisors with additional printed instructional materials.

The samples were collected after cooling of the total amount of milk and delivered to the selected accredited laboratory for analysis. These samples were taken at each farm visit, which makes a total of six samples per farm during the study period. The milk fat content was determined by the Gerber method (Anon., 2018), the protein content by the Kjeldahl method (Anon., 2014), the TNM value according to the ISO 4833-1:2013 method (Anon., 2013) and the SCC value by the fluoro-opto-electronic method on the Fossomatic TM apparatus and by the method of cytological staining of milk cells and counting under a microscope.

The IBM SPSS program was used for statistical data processing with a descriptive presentation of farm characteristics, scores for all questions of the questionnaire and value and score for milk composition, considering average scores, differences and proportions of scores, using ANOVA analysis and χ^2 test. To examine the relationship between the farm characteristics and the milk quality scores and the questions from the questionnaire, the size of the effect of the farm factors on the mentioned scores was determined using a partial η^2 test.

Results and Discussion

Analyzing the general score of body cleanliness at the herd level in Table 1, the most common score determined was 4 with 45.7%, followed by score 3 with 31.9%.

When evaluating body hygiene at the herd level, the score assigned to the largest number of examined animals was taken into account, as well as the average score. The most frequently obtained score of teat and udder base cleanliness by visual inspection was 5 (65.2%), while the scores for classes 3 and 4 were very similar (13.8% and 15.9%, respectively, see Table 2).

Table 1. General evaluation of the cows’ body cleanliness.

	Parameter	Frequency	%	Cumulative %
Score	2	56	8.7	8.7
	3	206	31.9	40.6
	4	295	45.7	86.2
	5	89	13.8	100
	Σ	646	100	100

Table 2. The inspection of teats and udder bases for soiling.

	Parameter	Frequency	%	Cumulative %
Score	1	14	2.2	2.2
	2	19	2.9	5.1
	3	89	13.8	18.9
	4	103	15.9	34.8
	5	421	65.2	100
	Σ	646	100	100

Regarding the hygiene of the teats (Table 3), which was determined visually and by using wet wipes or cotton wool to wipe the top of the teat, as well as by assigning the appropriate scores taking into account the number and percentage of teats whose tips were dirty, the most common score was 3 (good) amounting to 41.6%, followed by the percentage representation of score 4 (29.1%) and score 5 (24.5%).

Table 3. Maintenance of teat cleanliness.

	Parameter	Frequency	%	Cumulative %
Score	1	11	1.7	1.7
	2	20	3.1	4.8
	3	269	41.6	46.4
	4	188	29.1	75.5
	5	158	24.5	100
	Σ	646	100	100

Table 4 shows the univariate analysis of variance for the results related to the body hygiene parameters at the herd level (as a criterion, the score assigned to the largest number of examined animals and the average score) as hygiene measures.

The capacity, rearing system and capacity occupancy had a significant impact on of cow body hygiene and daily milk production. Other parameters did not have a statistically significant influence on cow body hygiene. The partial η^2 test revealed that the greatest impacts on daily milk production, capacity occupancy and capacity were 19.2%, 13.2% and 10.4%, respectively.

Table 4. Univariate analysis of variance for the assessment of the parameters of body hygiene of cows.

Tests of effects between factors and parameters						
Dependent variable	Question 1					
Source	Sum of squares type III	df	Average square	F	Significance	η^2
Corrected model	225.435a	200	1.127	2.362	0.000	0.515
Section	24.689	1	24.689	51.730	0.000	0.104
Capacity	24.755	14	1.768	3.705	0.000	0.104
Rearing system	7.526	1	7.526	15.768	0.000	0.034
Breed	0.248	1	0.248	0.519	0.471	0,001
Milking system	0.834	1	0.834	1.747	0.187	0.004
No. of cows in a facility	7.300	10	0.730	1.530	0.126	0.033
Capacity utilization	32.207	32	1.006	2.109	0.001	0.132
No. of cows milked	11.308	16	0.707	1.481	0.102	0.051
Daily milk production	50.385	75	0,672	1.408	0.020	0.192
Daily milk production per cow	15.614	25	0.625	1.309	0.147	0.068
Error	212.387	445	0.477			
Total	9023.000	646				
Total corrected	437.822	645				

a. $R^2 = 0.515$ (Adjusted $R^2 = 0.297$).

Table 5 shows the univariate analysis of variance for the results related to the parameter considering whether the teats and the base of the udder are visually inspected.

A highly significant influence for the visual inspection of teats and udder base and their soiling was found for capacity, milking system, capacity occupancy, daily milk production, daily milk production per cow, and number of dairy cows. Other parameters did not show significance for the visual examination of the teats and the base of the udder and their soiling. Taking into account the partial η^2 value, the greatest impact on the visual inspection of the teat and the base of the udder and their soiling was found for daily milk production (27.0%) and capacity occupancy (15.0%).

Table 6 shows the univariate analysis of variance for the results related to the parameter of maintaining teat cleanliness (determining visually or using wet wipes or cotton wool, which are used to wipe the top of the teat and evaluate accordingly; for the teat cleanliness rating, it was important to determine the number and percentage of teats whose tips were soiled), as hygiene measures in the conducted tests.

Table 5. Univariate analysis of variance for the assessment of teat and udder base cleanliness.

Tests of effects between factors and parameters						
Dependent variable	Question 2					
Source	Sum of squares type III	df	Average square	F	Significance	η^2
Corrected model	384.176[a]	200	1.921	3.724	0.000	0.626
Section	62.548	1	62.548	121.269	0.000	0.214
Capacity	21.432	14	1.531	2.968	0.000	0.085
Rearing system	1.921	1	1.921	3.724	0.054	0.008
Breed	1.465	1	1.465	2.840	0.093	0.006
Milking system	5.938	1	5.938	11.514	0.001	0.025
No. of cows in the facility	8.359	10	0.836	1.621	0.098	0.035
Capacity utilization	40.467	32	1.265	2.452	0.000	0.150
No. of cows milked	17.460	16	1.091	2.116	0.007	0.071
Daily milk production	84.896	75	1.132	2.195	0.000	0.270
Daily production per cow	25.182	25	1.007	1.953	0.004	0.099
Error	229.521	445	0.516			
Total	13064.000	646				
Total corrected	613.697	645				

a. $R^2 = 0.626$ (Adjusted $R^2 = 0.458$).

Table 6. Univariate analysis of variance for the evaluation of the teat cleanliness.

Tests of effects between factors and parameters						
Dependent variable	Question 3					
Source	Sum of squares type III	df	Average square	F	Significance	η^2
Corrected model	334.680[a]	200	1.673	3.402	0.000	0.605
Section	34.006	1	34.006	69.127	0.000	0.134
Capacity	23.282	14	1.663	3.381	0.000	0.096
Rearing system	0.459	1	0.459	0.934	0.334	0.002
Breed	1.477	1	1.477	3.003	0.084	0.007
Milking system	2.018	1	2.018	4.103	0.043	0.009
No. of cows in the facility	6.219	10	0.622	1.264	0.248	0.028
Capacity utilization	43.730	32	1.367	2.778	0.000	0.167
No. of cows milked	21.230	16	1.327	2.697	0.000	0.088
Daily milk production	99.206	75	1.323	2.689	0.000	0.312
Daily milk production per cow	25.534	25	1.021	2.076	0.002	0.104
Error	218.911	445	0.492			
Total	9470.000	646				
Total corrected	553.591	645				

a. $R^2 = 0.605$ ($R^2 = 0.427$).

In the category of parameters related to the hygiene of the cow's body, the general evaluation of the cleanliness of the body, the visual inspection of the teats and the base of the udders for soiling and the maintenance of the cleanliness of the teats were considered. The results of the test showed that during the implementation of the hygiene measures there was an increase in the scores for the general evaluation of the cleanliness of the cows' bodies (Figure 1) from the first to the sixth farm visit (F=21.47, P<0.0001). The increase resulted from a decrease in scores in the range 1–3 (presence of dried and fresh faeces) and an increase in the frequency of scores 4 and 5, indicating slight soiling or a clean body (χ^2 = 100.38, P<0.0001). In addition, the results showed that the value of scores for the visual inspection of the teats and the base of the udder for soiling during the implementation of hygiene measures (Figure 2) increased from the first to the sixth visit to the farm (F=8.83, P<0.0001). This increase resulted from a decrease in the frequency of scores indicating that the teats and the base of the udder were not visually inspected for soiling and an increase in the frequency of scores indicating that this inspection was performed daily (χ^2 = 66.83, P<0.0001). When examining the parameter of maintaining the cleanliness of the teats during the implementation of hygiene measures, an increase in the frequency value and rating for maintaining the cleanliness of the teats (Figure 3) was observed from the first to the sixth visit to the farm (F=13.12, P<0.0001). It was observed that the increase was due to the decrease in the frequency of scores 1 (the presence of a greater amount of older, neglected, dried dirt), 2 (a greater amount of dirt on the teats) and 3 (a smaller amount of dirt on the teats), and an increase in the frequency of score 4 (traces of disinfectant, without traces of impurities) and score 5, indicating the absence of traces of disinfectant colour or impurities (χ^2 = 76.30, P<0.0001).

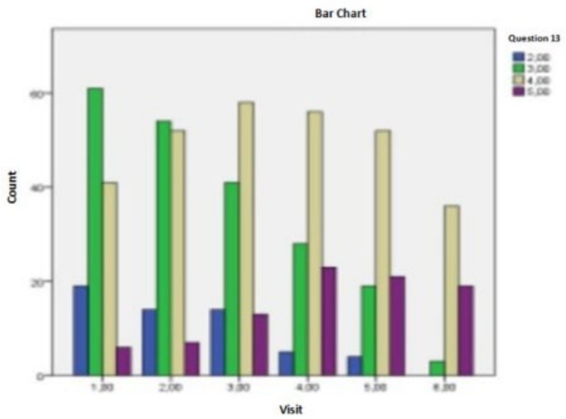

Figure 1. General assessment of body cleanliness during visits.

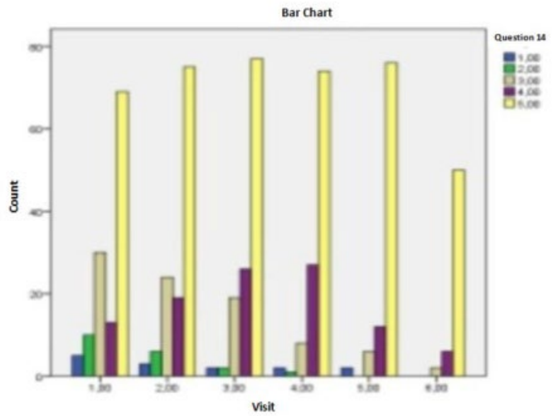

Figure 2. Visual inspection of teat and udder base soiling during visits.

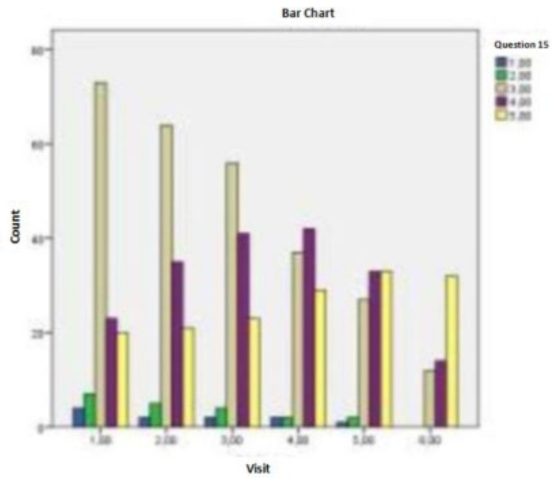

Figure 3. Maintenance of the cleanliness of the udder during visits.

Table 7 presents the results of univariate analysis of variance for TNM in milk in the conducted tests.

Table 7 shows that capacity, rearing system of cows, breed, number of cows in the facility and number of cows milked had a very significant effect on TNM. The factors of capacity occupancy, daily milk production and daily milk production per cow did not have a statistically significant impact.

The partial η^2 test shows that the percentage of milk protein was most influenced by daily milk production (14.8%), capacity occupancy (12.5%), daily milk production per cow (6.6%), number of cows milked (5.0%), capacity (4.0%), and number of cows in a facility (3.8%).

Table 7. Univariate analysis of variance for TNM.

Tests of effects between factors and parameters						
Dependent variable	TNM					
Source	Sum of squares type III	df	Average square	F	Significance	η^2
Corrected model	539.283[a]	200	2.696	1.620	0.000	0.421
Section	31.387	1	31.387	18.863	0.000	0.041
Capacity	30.925	14	2.209	1.328	0.187	0.040
Rearing system	3.352	1	3.352	2.015	0.156	0.005
Breed	1.577	1	1.577	0.948	0.331	0.002
Milking system	1.167	1	1.167	0.701	0.403	0.002
No. of cows in the facility	29.029	10	2.903	1.745	0.069	0.038
Capacity utilization	105.594	32	3.300	1.983	0.001	0.125
No. of cows milked	39.288	16	2.456	1.476	0.104	0.050
Daily milk production	128.588	75	1.715	1.030	0.416	0.148
Daily milk production per cow	52.576	25	2.103	1.264	0.179	0.066
Error	740.457	445	1.664			
Total	8772.000	646				
Total corrected	1279.740	645				

a. R^2 = 0.421 (Adjusted R^2 = 0.161).

It should be taken into account that the most pronounced increase in scores related to TNM in milk was found between the 3rd and 4th visits and that the ANOVA test revealed significant differences between visits (F=9.63, P<0.0001), and by using the LSD test, very significant differences were found between the 1st and 4th, 1st and 5th and 1st and 6th visits. Using the χ^2 test, very significant differences in TNM were found between visits. In essence, the number of scores 4 and 5 was found to increase in relation to the number of visits, especially for the 4th, 5th and 6th visits, which should be taken into account when defining good hygiene practices.

Table 8 shows a univariate analysis of variance for the results related to SCC in milk in the conducted tests. A gradual increase was observed in the mean values of SCC from the first to the third visit, then a more pronounced increase between the third and fourth visits, and a slightly less pronounced increase at the fifth visit compared to the fourth. Some decrease in this parameter was observed between the fifth and sixth visits. Furthermore, significant differences between visits were found in the analysis of variance for SCC (F=5.17, P<0.0001). In addition, SCC values varied depending on the visit and the application of control measures. Using the LSD test, a very significant difference was found between the 1st and 5th visits and significant differences were found between the 1st and 4th, and 1st and 6th visits, as well as a very significant difference between the 2nd and 4th, 5th and 6th, and between the 3rd and 4th, 5th and 6th visits, respectively. Finally, using the χ^2 test, very significant differences were found in SCC values between visits. It was found that the rate of scores 4 and 5 increased in relation to the ordinal number of visits, especially at the 4th, 5th and 6th visits.

Table 8. Univariate analysis of variance for SCC.

Tests of effects between factors and parameters						
Dependent variable	SCC					
Source	Sum of squares type III	df	Average square	F	Significance	η^2
Corrected model	403.831[a]	200	2.019	1.460	0.001	0.396
Section	34.137	1	34.137	24.691	0.000	0.053
Capacity	32.294	14	2.307	1.668	0.059	0.050
Rearing system	4.639	1	4.639	3.355	0.068	0.007
Breed	2.772	1	2.772	2.005	0.157	0.004
Milking system	1.425	1	1.425	1.030	0.311	0.002
No. of cows in the facility	40.129	10	4.013	2.903	0.002	0.061
Capacity utilization	101.318	32	3.166	2.290	0.000	0.141
No. of cows milked	21.476	16	1.342	0.971	0.488	0.034
Daily milk production	138.103	75	1.841	1.332	0.043	0.183
Daily milk production per cow	28.332	25	1.133	0.820	0.718	0.044
Error	615.227	445	1.383			
Total	10756.000	646				
Total corrected	1019.059	645				

a. $R^2 = 0.396$ ($R^2 = 0.125$).

All of the above results should be taken into account when determining farm and hygiene parameters that influence the increase in the SCC mean values. These parameters should be included in the consideration of corrective and preventive measures within the framework of good hygiene practices. It should also be taken into account that the analysis of the determined values shows that the number of visits had an influence on the percentage of milk fat ($p<0.1$, $F = 2.221$), while there was no influence on the protein percentage.

According to the research results, it is clear that certain hygiene procedures were of great importance before milking cows, such as visual examination of the udder for the presence of signs of inflammation or damage, visual examination of the teats and the base of the udder for their soiling, application of the pre-milking test, washing and disinfecting of teats and udders, application of the mastitis test, teat wiping procedures, udder massages, hygiene procedures before and during the installation of milking units, control of the milking machine, automatic vacuum interruption, total duration of milking from the beginning to the end of contact with the milker, as well as interruption of milking (poor actions of the milking personnel, noise, other cows, other animals, etc.), as determined by other authors

(Hristov et al., 1997; Tamime, 2009; Lemma et al., 2018). Furthermore, the research found that the cleanliness of the cow's body, a visual inspection of the teats and the base of the udders for their soiling by the milker, the overall cleanliness of the teats and trimming the hair from the udders had an impact on milk quality. Hygienic procedures after milking include the application of various disinfectants as soon as possible after removing the teat cups by dipping or spraying the teats (Hristov et al., 1997). The importance of maintaining the hygiene of the materials for wiping the udder and the accessories for the application of disinfectants was also highlighted. It has been stated that numerous studies show that the occurrence of new udder infections is directly related to greater soiling of the udder (Stewart et al., 2002; Berge and Baars, 2020). It is necessary to disinfect the teats of the udder immediately after milking with an agent that has the ability to close the teat opening. In addition, post-milking udder disinfection should be done regularly after each milking on farms, which is not the case on small farms where it is mostly poorly performed (Hristov et al., 1997; Hristov, 2002; Tamime, 2009).

Presently, there are several programs addressing the best management practices in milk production, including good hygiene practices (Costa et al., 2005), emphasizing that the key factor for milk quality is avoiding contamination of raw milk and dairy products. The failure to maintain adequate sanitary practices contributes to the bacterial contamination of milk, chemical substances or physical deterioration from various sources. Common predisposing factors for milk contamination include the milking environment, cow body, milking personnel, milking equipment, milk transport, utensils and liquids used during milking, which has been unequivocally confirmed in research. Finally, it is crucial to apply good hygienic practices in milk production, regardless of the size of the farm, to effectively protect public health in accordance with the claims made by Bekuma and Galmessa (2018).

European Union regulations require raw milk to come from animals without any symptoms of infectious diseases transmitted to humans through milk. The cows should be in good health and free of udder wounds, both of which could affect the quality of the milk. It is envisaged that milk from cows treated with approved medicinal products should be separated from milk originating from healthy cows (European Commission, 2004a). Therefore, animal health management aims to achieve and maintain a disease-free herd (Hillerton, 2004). This can be achieved when infected animals are cured or removed from the herd, and new infections are prevented. A closed herd production, when there is no introduction of animals from other farms, is an important measure for maintaining a disease-free herd. Treatment and separation of infected animals from the rest of the herd prevent the transmission of pathogenic microorganisms from cow to cow (Hillerton, 2004), as well as high-quality feed, facility hygiene and hygienic milking conditions. Mastitis control is an important issue for the dairy sector, so mastitis control programs have been developed and implemented in many countries (Ekman et al., 2005; Olde Riekerink et al., 2005; Van der Zvaag, 2005). They are usually based on five crucial principles: disinfection after milking, antibiotic therapy for dry cows, appropriate treatment of clinical cases, removal of chronically infected cows and regular maintenance of milking machines (Akam et al., 1989). In Norway, in 1982, a successful udder health program was implemented, with the main focus of this program on milking and the repair of milking machines, although treatment of cows' udders by drying and dipping teats in disinfectant was not required to the same extent. Nevertheless, this, combined with a change in farmer attitudes and cow breeding programs, led to a 50% reduction in clinical mastitis treatment, a reduction in SCC (somatic cell count – an indicator of subclinical mastitis) from 250,000 to 114,000 in 1 mL of milk, and a significant reduction in treatment costs during ten years since 1994 (Østeras and Sølverød, 2005). Contemporary mastitis control programs anticipate limiting the frequency of mastitis, and thus reducing SCC in milk to an economically tolerable level is mainly achieved by applying strict hygienic and sanitary measures in milking parlors and barns. Limiting the frequency of infections in the udder quarters of cows involves teat disinfection after each milking, service and maintenance of the milking machine, back-washing of the milking cups and washing of the udders with running water before milking, as well as the application of other hygienic and sanitary measures (Hristov, 2002).

Conclusion

Based on the results of the conducted study, it can be concluded that farm characteristics (capacity, housing system, breed, milking system, number of cows, capacity occupancy mostly had a very significant or significant impact on all hygiene parameters classified in the aforementioned categories, as well as on protein and fat content, SCC and TNM in milk. Very significant variations were found in the listed hygiene parameters of the farm depending on the farm visits, as well as a continuous trend of improving the scores of hygiene parameters of the farm in relation to the regular number of farm visits. Based on the obtained results, an increase in the mean values of the TNM scores was observed after each visit. The TNM ANOVA test revealed significant differences between visits ($F = 9.63$, $P<0.0001$). For SCC mean values, an increase in scores was found from the first to the third visit, then a more pronounced increase between the third and fourth visits, and a slightly less pronounced increase in the fifth visit. Some decrease was observed for this parameter between the fifth and sixth visits. Analysis of variance for SCC revealed highly significant differences between visits ($F = 5.17$, $P<0.0001$). The SCC significantly varied across all visits and control measures applied. Highly significant or significant differences were found between all visits by the LSD test and χ^2 test. It was observed that the number of visits tended to have a significant influence on the milk fat rate (F=2.221; P<0.1), but no influence on the milk protein rate (P = 0.480; F = 0.901).

Acknowledgements

This paper is the result of research carried out within the "Agreement on the realization and financing of scientific research work in 2023 between the Ministry of Science, Technological Development and innovation of the Republic of Serbia and the Faculty of Agriculture of the University of Belgrade, contract registration number: 451-03-47/2023-01/200116".

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Received: November 28, 2022
Accepted: March 2, 2023

UTICAJ POBOLJŠANJA HIGIJENE TELA I VIMENA NA BEZBEDNOST I SASTAV MLEKA NA MALIM FARMAMA U SRBIJI

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R e z i m e

Higijensko stanje muznih krava i njihovih vimena na 128 malih gazdinstava lociranih u različitim regionima Srbije, pretežno angažovanih na proizvodnji mleka, 5–15 krava, laktofriza i najmanje jedne mašine za mužu, procenjeno je korišćenjem sledećih indikatora: 1. opšta procena čistoće tela, 2. vizuelni pregled sisa i osnove vimena, i 3. održavanje čistoće vimena, ocenjeno na skali od 0 do 1 ili od 1 do 5. Uzorci su uzeti nakon hlađenja pri svakoj poseti farmi i testirani na sadržaj mlečnih proteina i masti, broj somatskih ćelija (engl. *somatic cell count* – SCC) i ukupan broj mikroorganizama (engl. *total number of microorganisms* – TNM). Sadržaj mlečne masti određen je Gerberovom metodom, sadržaj proteina Kjeldahlovom metodom, ukupan broj mikroorganizama metodom ISO 4833-1:2013, a broj somatskih ćelija upotrebom aparata Fossomatic TM. Program IBM SPSS je korišćen za statističku obradu podataka. Kapacitet, uslovi smeštaja, rasa, sistem muže, broj krava i popunjenost kapaciteta su uglavnom imali veoma značajan ili značajan uticaj na higijenske parametre, sadržaj proteina i masti, broj somatskih ćelija i ukupan broj mikroorganizama u mleku. Higijenski parametri su imali kontinuirani trend poboljšanja u odnosu na posete. Srednje vrednosti ocena za ukupan broj mikroorganizama su se povećavale posle svake posete, uz značajne razlike između poseta ($F=9,63$, $P<0,0001$). Ocene broja somatskih ćelija su veoma značajno varirale između poseta ($F=5,17$, $P<0,0001$). Broj poseta je pokazao tendenciju značajnog uticaja na masnoću mleka ($F=2,221$; $P<0,1$), ali ne i na udeo proteina ($P=0,480$; $F=0,901$).

Ključne reči: unapređenje, telo, vime, higijena, mleko, bezbednost, sastav, mala farma.

Primljeno: 28. novembra 2022.
Odobreno: 2. marta 2023.

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