

CORRELATIONS BETWEEN SOMATIC CELL COUNT AND MILK QUALITY IN TWO DAIRY FARMS FROM NORTH-WESTERN ROMANIA

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Abstract

The objectives of this study were to achieve an epidemiological investigation on subclinical mastitis in dairy cows and to evaluate milk quality according to factors such as somatic cell number, protein, fat, dry matter, freezing point. The study was carried out during 2014 in two farms located in north-west of Romania. Detection of subclinical mastitis at farm A was carried out using MAST-O-TEST method and at farm B by KERBATEST method. In terms of temporal evolution, the highest incidence of subclinical mastitis was recorded in summer (farm A: 4.38%, 5.18%, 5.78% and farm B: 4.46%, 5.36%). Regarding subclinical mastitis incidence in relation to age of the animals, the highest values were observed in animals ranging from 4-6 years (62.75% - farm A and 60.00% - farm B). The epidemiological study conducted in relation to the stage of lactation showed that the highest rate was recorded in cows in the 4th lactation (47.55% - farm A and 48.57% - farm B). The overall analysis of the results relating to the anatomical positioning of the affected quarter revealed that the highest frequency was observed in the hindquarters (68.16% - farm A and 68.57% - farm B). A higher incidence of subclinical mastitis was observed during summer season and therefore biochemical analysis and determination of somatic cells number (SCC) were performed only during this period. For these determinations an automated system - CombiFoss was used. The control group (C) showed SCC values between 130 - 300 $\text{SCC} \times 10^3 \text{ mL}^{-1}$ while in mastitis group (M) the number of somatic cells was between 678 - 1,705 $\text{SCC} \times 10^3 \text{ mL}^{-1}$. The mean values for the other parameters were as follows: dry matter (C-10.18%, S-8.36%), protein (C-3.41%, S-2.88%), fat (C-4.06%, S-3.28%), freezing point (C-0.529, S-0.609).

Key words: cow, subclinical mastitis, somatic cell count.

INTRODUCTION

Mastitis is known as one of the most common and economically important production disease among dairy cows in the developing countries. Most of the mastitis cases are without visible symptoms (subclinical) and pass unnoticed. Cows diagnosed with subclinical mastitis contribute the most to the total production loss for the farmer (Marta Woloszyn, 2007).

High somatic cell count (SCC) in milk is associated with mastitis.

SCC has proven to be a good indicator of udder health and is the most frequently used indicator of subclinical mastitis (Östensson, 1993). Mastitis has a negative effect on nutritional milk components making fat (Korhonen & Kaartinen, 1995; Walstra et al., 2006a) and protein (Korhonen, 1995; Walstra et al., 2006b) content decrease at high SCC levels.

MATERIALS AND METHODS

The research was carried out during 2014 in two farms from North-Western Romania (farm A and farm B) on a total of 614 lactating cows. Data on intrinsic factors that may act as risk factors on milk quality were collected.

An analysis of milk quality in terms of udder health was carried out taking into consideration several factors: season, age of animals, number of lactation, affected quarter and somatic cell counts.

The quality of milk was determined according to the fat content, protein, unsaturated dry matter and freezing point.

In farm A, subclinical mastitis detection was performed using the MAST-O-TEST method, while in farm B, detection of subclinical mastitis was conducted using the KERBATEST method.

A higher incidence of subclinical mastitis was observed during summer season and therefore physico-chemical analysis as well as determination of somatic cells number were performed only during this period. Thus, the second study was conducted on a total of 19 cows diagnosed with subclinical mastitis and 19 Romanian Spotted and Holstein Friesian half breed healthy cows. For these determinations an automated system – CombiFoss (Foss, Denmark) was used.

RESULTS AND DISCUSSIONS

Subclinical mastitis was identified in all categories of cows, with different variations depending on intrinsic factors that were studied.

Monthly analysis indicated that subclinical mastitis was diagnosed during all months of the year, but their incidence varies from month to month. Following the diagnosis of subclinical mastitis, conducted using the MAST–O–TEST method, in farm A, 204 cows were identified, the average monthly incidence being 3.45%; in farm B, as a result of mammary gland supervision with KERBATEST, 35 cows were diagnosed, the average monthly incidence being 3.27%. In our study, the percentage of subclinical mastitis in farm A ranged from 1.79% in December and 5.78% in August. In farm B values were between 0.89% and 5.36%. Subclinical mastitis had an uneven distribution, with an upward trend since January (1.79% for farm A and 0.89% for farm B) until August, reaching the highest values in June, July and August (farm A: 4.38%, 5.18%, 5.78% farm B: 4.46% and 5.36% respectively), followed by a decrease until December when the lowest value was recorded. The higher incidence of subclinical mastitis in summer (June, July and August) may be due both to high temperature and favorable conditions, as well as increased virulence of pathogens. Our results regarding the influence of season on mastitis are similar with those presented by Abdel-Rady and Sayed, 2010.

Analyzing the frequency of subclinical mastitis in cows, in relation to age, the highest value was observed in cows ranging between 4-6 years (farm A) - 62.75%. Cows aged over 6 years showed a subclinical mastitis frequency

of 25%, while the lowest percentage was recorded in cows between 2 and 3 years (12.25%). In farm B, an increased incidence in cows between 4-6 years has been reported (60%), followed by the group of cows over 6 years (25.71%), while the lowest rate was recorded in cows aged between 2 and 3 years (14.29%). Various other authors also reported an increase in mastitis frequency with age (Schultz, 1977; Dohoo et al., 1982; Bendixen et al., 1988; Abdel-Rady and Sayed, 2010).

Table 1. Maximum incidence obtained from the epidemiological study

	Season	Age	Lactation number	Affected quarters
Farm A	June- August	4-6 years 62.75%	4 th lactation 47.55%	Hindquarters 68.14%
	(4,38- 5,78)			
Farm B	June- August	4-6 years 60%	4 th lactation 48.57%	Hindquarters 68.57%
	(4,46- 5,36)			

The epidemiological study of subclinical mastitis in cows, conducted in relation to the stage of lactation showed that the occurrence of these diseases is directly proportional to the number of lactations. In farm A, the maximum incidence was found during the fourth lactation (47.55%), while the minimum value was recorded during the first lactation (8.82%). The same report was maintained for farm B with limits between 11.43% (first lactation) and 48.57% (fourth lactation).

The highest incidence of subclinical mastitis depending on the affected quarter was recorded for the hindquarters (farm A - 68.14%, farm B - 68.57%), while the percentage of forequarters affected was 31.86% in farm A and 31.43% in farm B.

A higher incidence of subclinical mastitis was observed a during summer season and therefore biochemical analysis and determination of somatic cells number were performed only during this period. A control group was chosen (C) made up of cows that showed SCC between $130-300 \text{ SCx}10^{-3}/\text{mL}^{-1}$ while in mastitis group (M) the number of somatic cells was between $678-1.705 \text{ SCCx}10^{-3} \text{ mL}^{-1}$.

The mean values of physico-chemical parameters evaluated (dry matter and protein, fat and freezing point) are presented in Table 2.

The values obtained from mastitic milk samples in case of non-fat dry matter ranged from 7.69% to 9.26% with an average of 8.36%.

Table 2. The mean values of physico-chemical parameters for the groups studied

	SCC $\times 10^{-3}$ mL ⁻¹	Dry matter (%)	Protein (%)	Fat (%)	Freezing point
Mastitis group (M)	1.249	8.36	2.88	3.28	-0.609
Control group (C)	232.63	10.18	3.41	4.06	-0.529

The values of this parameter in control group ranged between 9.35% - 11.20% with an average of 10.18%. All recorded values of this parameter were below accepted limit (12.4 g/100 g milk). In case of milk proteins, mastitic milk values ranged between a minimum of 2.67% while the maximum level was 3.2% with an average of 2.88%. In healthy cows values were between 3.23% and 3.64% with an average of 3.41%. The percentage of fat for M group ranged between 2.9% - 4% with a mean value of 3.28%, while in control group normal values between 3.5% and 4.5% were found, with an average of 4.06%.

This data is in agreement with other findings, according to which mastitic milk shows lower percentages of protein and fat (Korhonen, 1995; Korhonen and Kaartinen, 1995; Walstra et al., 2006a; Walstra et al., 2006b).

Freezing point values ranged between - 0.531 and - 0.643 in mastitis milk and between - 0.520 and - 0.544 in control group with average values of - 0.609 and - 0.529, respectively.

CONCLUSIONS

In terms of temporal evolution of mastitis, there is a variable distribution from one month to another, and from one season to another, the highest incidence being recorded in summer (farm A: 4.38%, 5.18%, 5.78% farm B: 4.46%, 5.36%).

Regarding the incidence of subclinical mastitis in relation to the age of animals the highest values were observed in animals ranging between 4-6 years (62.75% - farm A and 60% - farm B).

Epidemiological investigation of subclinical mastitis in cows conducted in relation to the stage of lactation showed that the occurrence of

these diseases is directly proportional to the number of lactations, the highest rate being recorded in cows in the 4th lactation (47.55% in farm A and 48.57% in farm B).

The results obtained in relation to the affected quarter by their anatomical position showed that the highest frequency occurred in the hindquarters (68.14% - farm A and 68.57% - farm B).

Healthy animals showed SCC values between 130 - 300 SCC $\times 10^{-3}$ mL⁻¹ while the number of somatic cells in cows with subclinical mastitis was between 678 - 1.705 SCC $\times 10^{-3}$ mL⁻¹. The mean values for the other parameters were as follows: dry matter (C-10.18%, M-8.36%), protein (C-3.41%, M-2.88%), fat (C-4.06%, M-3.28%), freezing point (C-0.529, M-0.609).

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