Researches Regarding the Influence of Lactation Order on Somatic Cell Count in Milk During Lactation

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Abstract
Aim of the present study was to establish influence that lactation order has on the number of somatic cells from raw milk in Romanian Black and White breed cows. The study was carried out on 125 lactations of 92 cows. Data were statistically processed using Microsoft Statistica program, and by variance analysis Anova/Manova. Results obtained shown that primiparous cows had a somatic index smaller (5.29), for this index corresponds a lower number of somatic cell/ml of 195000. In multiparous cows, during the fourth lactation, the greatest somatic index was registered (5.81), value that corresponds with a concentration of somatic cells in milk/ml of 646000.

Keywords: cow milk, lactation order, Romanian Black and White breed, somatic cell count

1. Introduction

By determining the number of somatic cell count from milk we can get information's about the health status of the mammary gland of an individual or the entire herd. The number of somatic cell count it is widely accepted within European Community as an indicator for the appreciation of milk quality (health index) [1].
Mastitis which is the major cause of an high number of somatic cells in milk, continues to be one of the most expensive diseases which involves several factors, that cannot be eliminated and for this reason, must be controlled in order to establish the proper diagnostic and treatment [2].
The aim of the paper was to evaluate the influence of lactation order on milk somatic cell count.

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2. Materials and methods

The study was carried out in the didactical farm of USAMVB Timisoara, cows from Romanian Black and White breed were used in the research. Was pursued the influence of the cows age on the milk yield, fat and protein percentage during normal lactation, 125 lactations were registered.
Data registered were the analysed by ANOVA/MANOVA method in order to determine averages and dispersion indices.
Based on the averages registered, were calculated parameters of the lactation curves by using the mathematic model first described by P.D.P. Wood in 1967, named incomplete gamma function [4].
In the current paper somatic cell score was used for logarithmic transformation of the real number of somatic cells count from the milk samples. This transformation was made in order to reduce variation of this character for a better statistic calculation, but also for the remaining of the potential existent differences between the conditioning factors analysed.

Number of somatic cells count (SCC) from milk has been transformed in somatic cell score (SCS) according to the DHIA regulations (Dairy Herd Improvement Agency). This transformation is presented in table 1 [3].

Table 1. SCC conversion (number of somatic cells count from milk) in SCS (somatic cell score)

SCC (umber of somatic cells count)	SCS(Somatic cell score)
12500	0
25000	1
50000	2
100000	3
200000	4
400000	5
800000	6
1600000	7
3200000	8

3. Results and discussion

In table 2 are presented averages and dispersion indices for gamma equation parameters incomplete function in somatic cells count from milk during normal lactation based on the age of Romanian Black and White cows breed studied.

Number of somatic cells count (SCC) transformed into somatic cell score (SCS) in the first day of control (a parameter) has been lowest in primiparous cows 5.29, and had grown gradually to secundiparous cows to 5.60 and in cows during fifth lactation and over to 5.62 the highest somatic cell score has been registered in the milk of multiparous cows during the fourth lactation (5.81) followed by cows in their third lactation (5.64).

Daily dropping rate of the somatic cell score (parameter b) had the greatest value in fourth lactation multiparous cows (-0.023298), followed by third lactation multiparous (-0.010037). Smallest somatic cell score was registered in primiparous cows, where the value of the b parameter has been of -0.001608.

Daily growing rate of the somatic cell score (parameter c) registered the lowest value in third lactation multiparous (-0.000038), growing then at the value of -0.000057 in secundiparous cows. The highest growth rate of the somatic cell score was registered in cows that were in their fourth lactation, of -0.000242, followed by multiparous in the fifth lactation (-0.000188).

Table 2. Averages and dispersion indices for gamma equation parameters incomplete function in somatic cells count from milk during normal lactation based on the age of Romanian Black and White cows breed

Lactation number	n	Normal lactation					
		a		b		c	
		$X \pm S_x$	s	$X \pm S_x$	s	$X \pm S_x$	s
1	37	5.298557± 0.152076	0.925045	-.001608± 0.008482	0.051593	-.000077± 0.000070	0.000425
2	29	5.601761± 0.225885	1.083307	-.009424± 0.010735	0.051484	-.000057± 0.000085	0.000410
3	23	5.641529± 0.236906	1.275779	-.010037± 0.011259	0.060630	-.000038± 0.000080	0.000429
4	14	5.811105± 0.216503	0.810080	-.023298± 0.008783	0.032863	-.000242± 0.000073	0.000271
5 and over	22	5.625575± 0.319626	1.499179	-.009575± 0.015258	0.071565	-.000188± 0.000107	0.000500

Somatic index evolution during normal lactation based on age of the cows is showed in figure 1. From analyze of the figure it can be observed the difference between the somatic cell score based on the cows age. It the case of all cows, somatic cell score from milk has been high at the beginning of lactation, and dropped and registered a minimum limit, and during the last period of the lactation has started to grow again.

Multiparous cows during forth lactation had registered the higher somatic cell score at the debut of lactation, and dropped gradually in the first month of lactation, achieving the minimum value at 96 days of lactation.

Secundiparous, third and fifth lactation cows had approximately the same value of the somatic cell score and registered the same evolution during entire lactation. Multiparous cows, during their fifth and over lactations had registered a greater growth rate of the somatic cell score during the end of lactation, thus the value of the somatic cell score at the end of the normal lactation was higher.

Primiparous cows had registered the lowest somatic cell score at the beginning of lactation, and dropped slightly in the first month of lactation, and then had a strong tendency of growing until the end of lactation.

Cows during fourth lactation had registered the ideal curve of the somatic cell score evolution during lactation. Thus, initial number of somatic cells count form milk has been very high, dropping suddenly during first month of lactation, after which the evolution was relatively slack until the end of lactation.

In table 3 are presented Differences and statistical significance gamma equation parameters incomplete in somatic index from milk evolution during different stages of lactation based on age of cows studied. From analyzing the data presented in the table it can be observed that somatic cell score evolution had registered distinctive differences ($p<0.01$) between lactation 1 and lactation 4 for a parameter (-0.51) and b parameter (0.02169). Also, significant differences ($p<0.01$) were registered between lactations 4 and 5 and over for b parameter (-0.013723).

Primiparous cows had a parameter significantly smaller ($p<0.05$) and b parameter significantly larger compared to cows in second lactation (a=-0.30 and b=0.007817), third lactation (a=-0.34 and b=0.008429) and five and over (a=-0.32 and b=0.007968). Also cows they were in the third lactation had registered c parameter significantly larger ($p<0.05$) than cows in 4 lactation (0.000204) and cows in 5 and over lactations (0.000149).

Table 3. Differences and statistical significance gamma equation parameters incomplete in somatic index from milk evolution during different stages of lactation based on age of cows

Trait	Lactation number	Parameter	Lactation number			
			5 and over	4	3	2
SOMATIC CELL SCORE	1	a	-0.327018*	-0.512548**	-0.342972*	-0.303204*
		b	0.007968*	0.021690**	0.008429*	0.007817*
		c	ns	ns	ns	ns
	2	a	ns	ns	ns	-
		b	ns	ns	ns	-
		c	ns	ns	ns	-
	3	a	ns	ns	-	-
		b	ns	ns	-	-
		c	0.000149*	0.000204*	-	-
	4	a	ns	-	-	-
		b	-0.013723**	-	-	-
		c	ns	-	-	-

ns – $p>0.05$; * - $p<0.05$; ** - $p<0.01$; *** - $p<0.001$

The rest of the values din not reached the threshold of statistical significance ($p>0.05$).

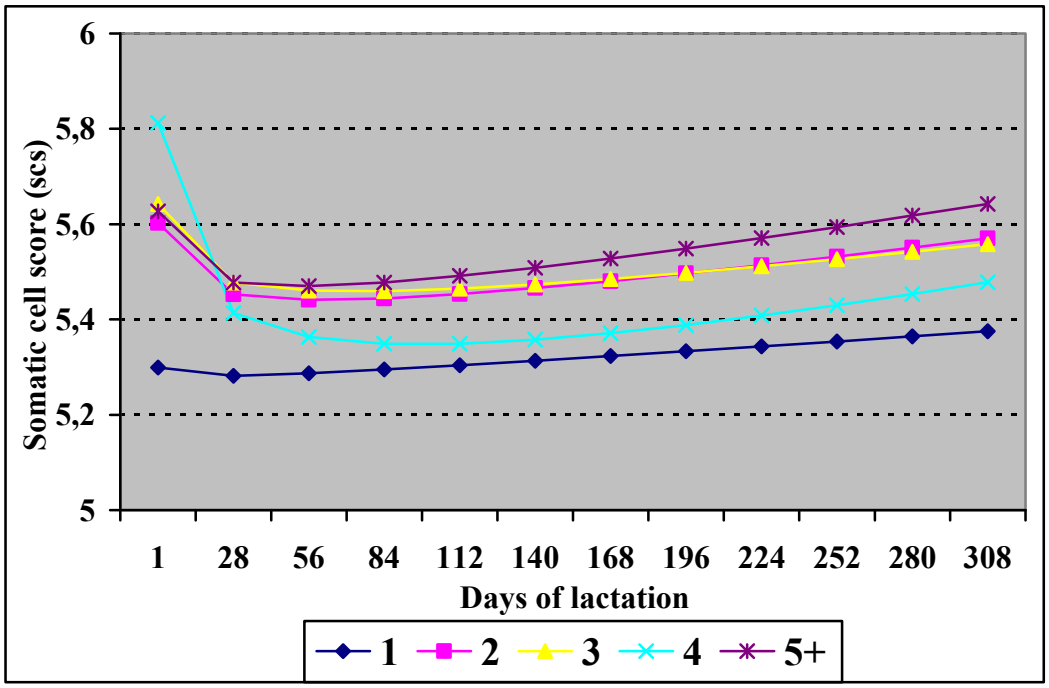

Figure 1. Somatic index evolution during normal lactation based on age of the cows

4. Conclusions

Age of the cows has significantly influenced ($p<0.01$) the somatic cell score evolution between lactations 1 and 4 (a parameter = -0.51). Also, had registered significant values ($p<0.01$) between lactations 1 and 2, lactations 1 and 3 and lactations 1 and 5 and over.

Lactation curve had been significant different ($p<0.01$) by means of daily dropping rate (b parameter) of the somatic cell score between lactations 1 and 4 (0.021690) and between lactations 4 and 5 and over (-0.013723).

Based on the lactation number, it can be observed that milk produced by primiparous cows has had the lowest somatic cell score (5.29), this index corresponding to a somatic cells count of 195000/ml. Multiparous cows during the fourth lactation had registered the highest somatic cell score of 5.81, value that corresponds to a number of somatic cells count of 646000/ml.

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