Researches Regarding the Influence of Calving Interval on the Number of Somatic Cells during Lactation in Romanian Black and White Cows

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Abstract
The aim of this paper was to study the influence of calving interval on the number of somatic cells from milk in Romanian Black and White cows. The study was conducted on a total of 125 lactations from 92 cows. Data were recorded and statistically analyzed by ANOVA/MANOVA method determining the means and dispersion indices. The results indicated that calving interval influenced significantly ($p < 0.05$) changes in the somatic index between calving interval below 350 days and calving interval between 351 and 450 days (0.33). Milk produced from cows with calving interval below 350 days had the smallest somatic index (5,33) which corresponds to a number of somatic cells around 214000 cells/ml. Cows with calving interval between 351 and 450 days had the highest value of the somatic index 5.67, which corresponds to a concentration of 468000 somatic cells/ml.

Keywords: calving interval, dairy cows, Romanian Black and White breed, somatic cells.

1. Introduction

The calving interval is the time between two successive births and affects the regularity of births, the number of calves produced during the life, the milk production on lactation and on productive life. Since the length of gestation it is relatively constant (283-285 days) the interval between calving depends on: rest during pregnancy, lactation and dry period length [1]. Cziszter et al. (2007) showed that the county, season and year had significant effects on the chemical composition of milk and milk somatic cell counts with direct influence of the structure of race and type of farm from which the raw milk came for processing [2]

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2. Materials and methods

The study was carried out in the didactical farm of USAMVB Timişoara, 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 analyzed by ANOVA/MANOVA method in order to determine averages and dispersion indices. Based on the averages registered, parameters of the lactation curves were calculated by using the mathematic model first described by P.D.P. Wood in 1967, named incomplete gamma function [3]. 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 analyzed.

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 [4].

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

Table 2 presents the average values and dispersion indices for incomplete gamma function parameters somatic cell counts turned into lactation somatic index according to the calving interval in Romanian Black and White cows studied.

The number of somatic cells transformed into somatic index (SCS) on the first day of control was lowest in cows with the calving interval of up to 350 days being (5.33), followed by cattle with the calving interval over 450 days (5.47). The largest milk somatic index achieved at a calving interval between 350-450 days (5.67).

Somatic index decreasing daily rate (parameter b) had the highest value in the calving interval between 350-450 days (-0.012113). The values of parameter b, which describe somatic index decreasing rate until reaching the peak of the lactation curve for the calving interval, had the lowest index in the calving interval ranging up to 350 days (0.003359).

The daily rate of growth of somatic index (parameter c) has the lowest value in the calving interval with more than 450 days (-0.000079), then increased in cows with calving interval in the range between 350-450 days (- 0.000108). The highest somatic growth rate after reaching the peak index of the lactation curve was obtained in the calving interval up to 350 days (0.000169).

Developments in milk somatic index of the calving interval are shown in Figure 1. In the analysis of figure differences between the somatic indexes can be observed according to the range of calving interval. For all intervals between calving, milk somatic index was high at the beginning of lactation, then declined to reach a minimum threshold for late lactation to increase again, except with the calving interval up to 350 days where the index increased weaning somatic above the first control.

Table 3.presents the statistical significance of differences and incomplete gamma function parameters for the development of somatic index of milk during lactation according to the calving interval from Romanian Black Spotted cows studied.

The table analysis shows that at a calving interval of 350 days somatic index was significantly less (a =- 0.33) and decreasing rate of somatic index was significantly higher (b = 0.008754) compared with a calving interval ranging between 351 and 450 days.

The rate of growth until the end of lactation for the somatic index was significantly lower (c =- 0.00009, $p < 0.05$) in the interval between births of up to 350 days compared with the interval between births between 351 and 450 days.

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

Calving interval	n	Normal lactation					
		a		b		c	
		X±SEM	SD	X±SEM	SD	X±SEM	SD
Up to 350	14	5.33903±0.31220	1.16815	-0.00336±0.01723	0.06448	-0.00017±0.000164	0.000614
351-450	55	5.67186±0.16393	1.22672	-0.01211±0.00781	0.05851	-0.00011±0.000059	0.000441
over 450	56	5.47707±0.14142	1.04878	-0.00689±0.00687	0.05092	-0.00008±0.000047	0.000346

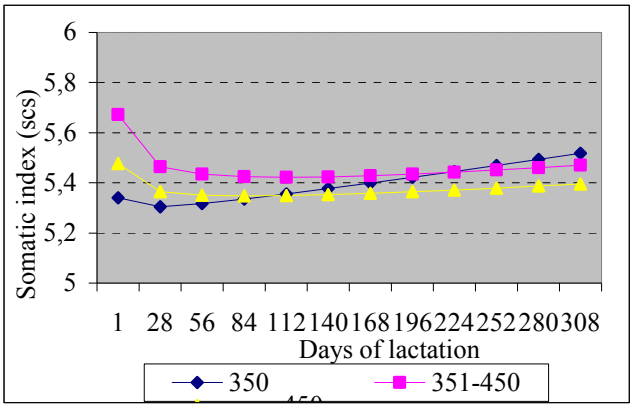

Figure 1. Somatic index evolution during normal lactation based on calving interval in Romanian Black and White cows breed

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

Trait	Calving interval	Parameter	Calving interval	
			Over 450	351-450
Somatic index	Up to 350	a	ns	-0.332833*
		b	ns	0.008754*
		c	-0.000090*	ns
	351-450	a	ns	-
		b	ns	-
		c	ns	-

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

4. Conclusions

The interval between calving influenced significantly (p<0.05) changes in the initial somatic index (parameter a) at a calving interval of up to 350 days the index was 0.33 higher than at a calving interval between 351-450 days.

Regarding the daily rate of decrease (parameter b) somatic index was significant different (p<0.05) for a calving interval up to 350 days with 0.008754 compared with a calving interval of 351-450 days. For lactation curve there was a significant difference (p>0.05) in terms of lowering the daily rate (parameter c) somatic index for a calving interval of 350 days and for a calving interval between 351-450 days (-0.00009).

Depending on the calving interval, the lowest number of milk somatic cells (somatic initial index 5.33) was obtained from cows that had calving interval up to 350 days, which corresponds to a number of somatic cells about 214,000 cells / ml. The highest somatic index was initially obtained from a calving interval of 351-450 days (5.67) corresponding to a number of 468 000 somatic cells / ml.

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