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Studies on Nutritional Quality of Produced Milk from Dairy Cows Farms Maintained in Loose Housing Linked to the number of Somatic Cells

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Abstract. The present research aimed at evaluating the quality of milk in terms of nutrition, in terms of protein, fat, lactose, SUT and technological quality: NCS/ml milk samples taken from cows milk from 24 farms whose maintenance system is free, and the relationship between these parameters. Number of dairy cows from farms varies between 22 heads (F14, F16) and 63 heads (F5).

Protein value of milk samples (420) have variable average: 3.12±0.02-3.29±0.06, and for fat parameter most samples belong to interval class 4.4.1% interval (165 samples) followed by those with values between 3.5 and 3.9% (145 samples). Report fat/protein is good at the 23 farms, from 1.2 to 1.33 and slightly lower for farm F18 (1.19). Lactose has averaged between: 4.79±0.18-5.14±0.02 and total dry matter (SUT): 11.95 (F4) and 12.72 (F3).

The number of individual samples analyzed somatic cells present averages/farm between 216±19.79 (F11)-411.5±9.19 (F20) and a rate of 2 to 7% incidence of mastitis is present in the farms studied.

Keywords: dairy cow, milk, nutritional quality, NSC/ml milk

INTRODUCTION

Addressing nutritional quality, opposite number of somatic cells in milk are important both in terms of efficiency of transformation by industrialization of milk and animal health protection and consumer default (Man C, 2007). A fresh milk, uninfected translates into a total of up to 200,000 SCC / ml (Khan M.Z *et al*., 2006). Some research indicates that cow's milk has a normal level of 100,000 to 150,000 SCC / ml milk (Hillerton, 1999) and any growth disturbance is a secretory. This not only leads to illness while udder but lead to a change in the overall milk quality by the impossibility of obtaining certain types of milk products (Fernandes *et al*., 2007). Action of somatic cell counts and nutritional values of parameters obtained in this study are similar to results obtained by other researchers (Jones 2006, Schalliabum, 2001), explanation of the links being removed from the reduction of synthetic activity in the breast tissue (Harmon, 1994).

MATERIALS AND METHODS

The purpose of this paper refers to obtaining results on technological and nutritional quality of milk, which were used as working methods:

- Sampling of milk and highlighting key components of milk: protein, fat, lactose and SUT with device Milkoscan 130.

- The number of somatic cells in milk samples were taken individually California Mastitis Test determined and SCC / ml milk with Somatocount 150.
- Statistical processing of results was done by descriptive statistics, applying SPSS software test statistic using version 7, and Pearson correlations based on interpretation by Cohen, 1988, Origin 7 being basic program for graphical interpretation of the results.

RESULTS AND DISCUSSION

Number of farms in this study are taken from 24 animals loose housing benefit. Number of heads of farm varies from 22 heads (F14, F16) and 63 heads (F5).

Average daily milk production per farm is set between 654.2 l/day (on average 22 l milk/cow in milk cap)-F14 and 1.895.3 l/day (22 l milk/head/day-F6) (Fig. 1).

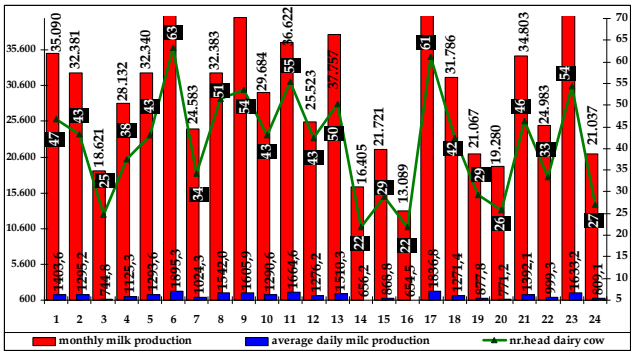

Fig. 1. No. of animals, daily and monthly milk production

Assessment of milk production in terms of quality was achieved in terms of SUT, protein and % fat values obtained are satisfactory and good.

Although not a key parameter in selecting cows SUT matter seen in terms of others' parameters of milk composition and especially protein and fat (Velea C., 2009). Table summarizing and analyzing the parameter values obtained from the total milk solids we note values close to the averages obtained were 12.11±0.07 range (F1) and 12.4±0.05 (F14), minimum: 11.95 (F4) and the maximum value -12.03:12.72 (F3)

Of the samples analyzed (420) protein is distribution parameter values average 3.12±0.02 minimum (F23) and 3.29±0.06 maximum (F10), individual values were between 3.10-3.37.

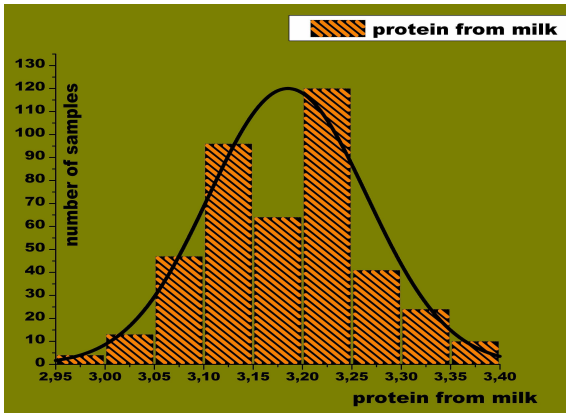

Fig. 2. Protein from SUT %

From *Figure 2* we see that most samples are included within the 3.20-3.25 interval class (120 samples) supplemented by the range of class between 3.10-3.15 (98 samples). Class 3.15-3.20 range comprises of 63 samples and between 3.05-3.10, 45 samples. The remaining samples fall between the values: 3.25-3 .30 (40 samples), 3.30-3.35 (25 samples) and a small number of sample values meet in May in the percentage of protein: 3.35-3.40 (9 samples). Extreme indicating low levels of protein in milk between 3.00-3.05 meet a number of 15 samples and 5 samples meet the values below 3.0 (2.95-3.00).

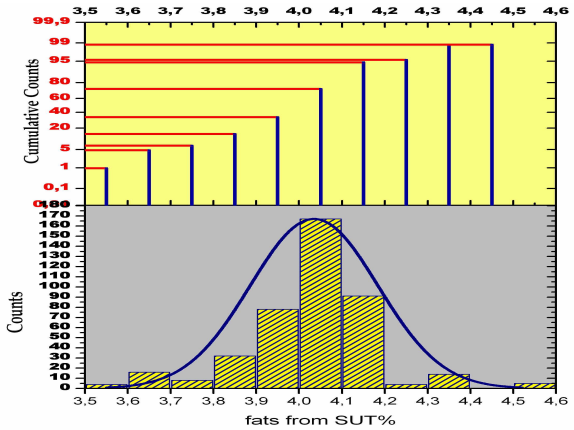

Fig. 3. Fats from SUT %

Of SUT overall average percentage of fat samples taken and analyzed (420) 0.14±4.03 is, with maximum 4.54% and a minimum of 3.57%. From the results of samples analyzed in *Figure 3* note played the highest number of samples (165) belonging to the class interval 4-4.1%, 85 samples belong to the range 4.1-4.2%, and analyzed 145 samples containing a percentage of between 3.5-3.9% fat and 25 samples over 4.2%.

Tab. 1

Mean obtained from analysis of nutritional quality, bacteriological NTG/ml a nd total technological somatic cells/ml milk on farms monitored and the relationship between milk components, protein, fat, lactose and somatic cell count

Nr farms	Nr. head dairy cow	SUT		fat from SUT		protein from SUT		lactoses from SUT		NCS	
		X	SD	X	SD	X	SD	X	SD	X	SD
F1	43	12.11	0.071	4.04	0.07	3.25	0.07	4.80	0.16	295	21.213
F2	38	12.50	0.153	4.02	0.08	3.26	0.05	5.07	0.10	326.5	23.335
F3	22	12.27	0.060	4.08	0.18	3.22	0.08	5.03	0.09	272	36.770
F4	35	12.13	0.170	4.01	0.21	3.24	0.06	4.96	0.10	346.5	58.690
F5	38	12.33	0.066	4.05	0.06	3.13	0.08	5.06	0.02	384.5	7.778
F6	61	12.23	0.062	3.97	0.13	3.11	0.05	5.06	0.04	243	9.899
F7	32	12.22	0.198	4.07	0.11	3.21	0.11	5.14	0.02	307.5	10.607
F8	47	12.31	0.045	4.04	0.04	3.15	0.07	5.09	0.03	364	182.43
F9	52	12.26	0.097	4.04	0.11	3.18	0.05	4.79	0.18	367	46.669
F10	40	12.18	0.119	4.14	0.13	3.29	0.06	4.88	0.14	357	46.669
F11	49	12.30	0.107	4.11	0.28	3.23	0.04	4.95	0.11	216	19.799
F12	38	12.27	0.025	3.94	0.32	3.23	0.02	4.87	0.12	332.5	17.678
F13	46	12.19	0.144	4.12	0.05	3.09	0.10	5.02	0.27	315	91.924
F14	19	12.40	0.052	4.10	0.08	3.18	0.05	5.06	0.16	271.5	16.263
F15	24	12.22	0.063	4.07	0.05	3.18	0.07	4.98	0.11	359.5	27.577
F16	20	12.19	0.147	4.09	0.04	3.15	0.07	5.03	0.14	255	35.355
F17	58	12.33	0.126	3.99	0.21	3.19	0.04	4.98	0.09	335	49.497
F18	37	12.28	0.070	3.82	0.15	3.20	0.08	4.94	0.15	375	10.07

F19	25	12.38	0.041	3.95	0.08	3.13	0.04	4.98	0.14	374	41.012
F20	22	12.39	0.056	4.03	0.09	3.16	0.06	4.97	0.11	411.5	9.192
F21	43	12.34	0.068	3.97	0.08	3.15	0.07	4.99	0.11	340.5	84.146
F22	31	12.23	0.173	4.04	0.02	3.17	0.07	5.00	0.17	331	14.84
F23	51	12.12	0.059	4.06	0.08	3.12	0.02	4.92	0.18	388	90.510
F24	23	12.32	0.086	3.96	0.10	3.18	0.05	5.00	0.04	415	49.497
Significant degree between nutritional quality of milk: protein, fat, lactose and NCS				*** P<0.0001 extremely significant							
						*** P<0.0001 extremely significant					
								*** P<0.0001 extremely significant			

Report on the *fat/protein*, which also is an important indicator of good feeding and maintenance of expression of optimal values obtained expressed graphically (Fig. 4) indicates that: in the analyzed samples/farm, in 23 of the farms in terms of nutritional quality studied two parameters is good, being comprised between 1.22 (F12)-1.33 (F13) and slightly below the reference value for F18 farm, where overall ratio is 1.19.

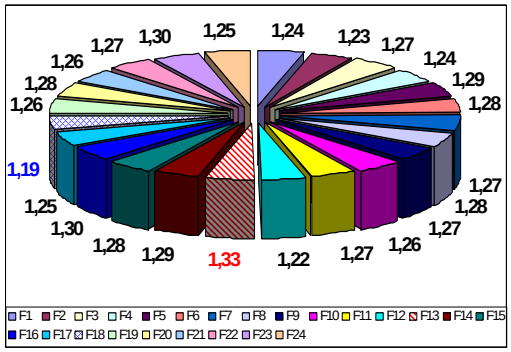

Fig. 4. Fat/protein ratio

Lactose in milk is another shape parameter SUT. Averages are between: 4.79±(F9) and 5.14±(F7)

Technological quality, expressed by SCC/ml milk as can be seen in figure presents significant fluctuations of SCC/ml milk, minimum values being 190x1000 SCC/ml and maximum 500x1000 SCC/ml milk, a decisive factor in obtaining these values being dependent on the conditions of shelter and hygiene of milking udder before.

Averages in the farm presents fluctuating curve, with minimum of 243±9.89 x1000 (F6) 216±19.79x1000 (F11) and maximum: 411.5±9.19 x1000 (F20)-415±49.49 x1000 (F24). After establishing the level of significance between protein, fat, lactose is not found significant differences in the exchange between these components and somatic cell count / ml milk are extremely significant differences (***P<0.0001). Based on the results of only 8% of dairy farms fall within the parameters of EU requirements (NCS values below 250,000/ml milk), milk quality (11-216 F±19.79x1000 NCS/ml milk and F6 -243±243±9.8x1000 NCS/ml milk).

The current situation on the ground reflected by the parameter analysis results NCS/ml milk values that are found in fairly wide limits imposed to the objectives (250x1000 NCS/ml milk), percentage exceeds 12.5% of farms with 0-10% normative (F3, F14, F16) in 4.2% of firm value is higher NCS by 10-20% (F1). In 8.3% of SCN cases has increased between 20-30% (F7, F13). Significant proportion (25%) have farms in the NCS value is higher by 30-40%: F2, F4, F12, F17, F21, F22. In the category of farms in the NCS has values by 40-50% compared to the 20.8% limit of the farms fall under study: F8, F9, F10, F15, F19. Although

the share is lower in 12.5% of cases, the NCS is 50-60% greater, F5, F18, F23. In 8.3% of farms, NCS parameter results are 60-70% higher: F20, F24.

From plot (Fig. 6) it is noted that: of all cows from a farm a percentage between 2% (F16) and 7% (F11) are cow whose udder is affected by mastitis at an early stage of mastitis to the clinic. This is reflected in the nutritional quality obtained from 86 cows with udder heads from affected farms studied.

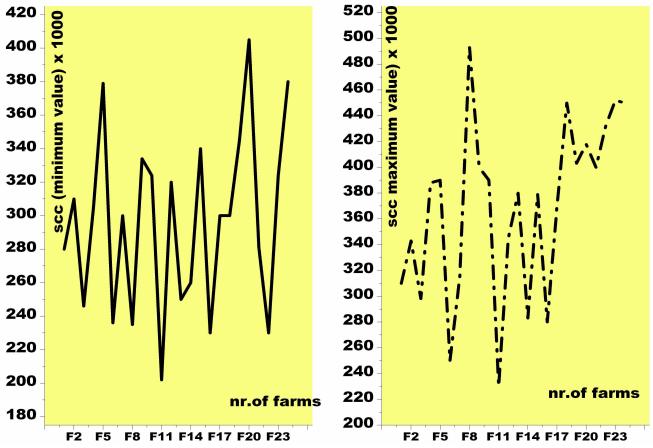

Fig. 5. Number of somatic cells/ml milkx1000

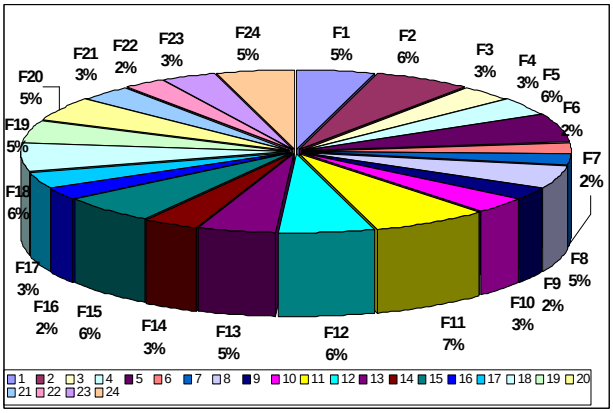

Fig. 6. % of dairy cow affected by mastitis

The analysis table (Tab. 2) the percentage of mastitis milk fat it has a downward curve to the values obtained for normal milk and transposed in *Table 1*. Following analysis of the minimum values are found between fat percentage: 3.3% (F18) -3.75% (F6), with most values fall on the axle: 3.5%. Peaks are situated on the axis values between 3.37% (F20) and 3.9 (F13). Analyzing the obtained average fat content is between 3.5±0.10-3.67±0.13%.

Tab. 2

Components affected by mastitis milk

Parameter:	SCC		PROTEIN		FAT		LACTOSE	
	min	max	min.	max	min	max	min.	max.
Mean:	296.50	368.71	3.077	3.18	3.549	3.677	4.538	4.62
SD	52.17	67.01	0.061	0.062	0.106	0.136	0.143	0.11

In mastitis milk, milk protein is situated between the values between the limits: 3 (F8, F9, F18, F19, F20)-3.23 (F16) lows and highs of 3.05 (F19)-3.3 (F9, F16, F21).

Mastitis milk *lactose* in milk decreased to normal values obtained, which is between: 4.3 (F2, F5, F9, F21)-4.58 (F7, F12, F13)-4.79 (F15)-minimum and 4.4 (F9, F10)-4.79 (F15), maximum, mean results ranging from: 4.53±0.10-4.62±0.11, close to those quoted by other authors (Sharma N. *et al*., 2011).

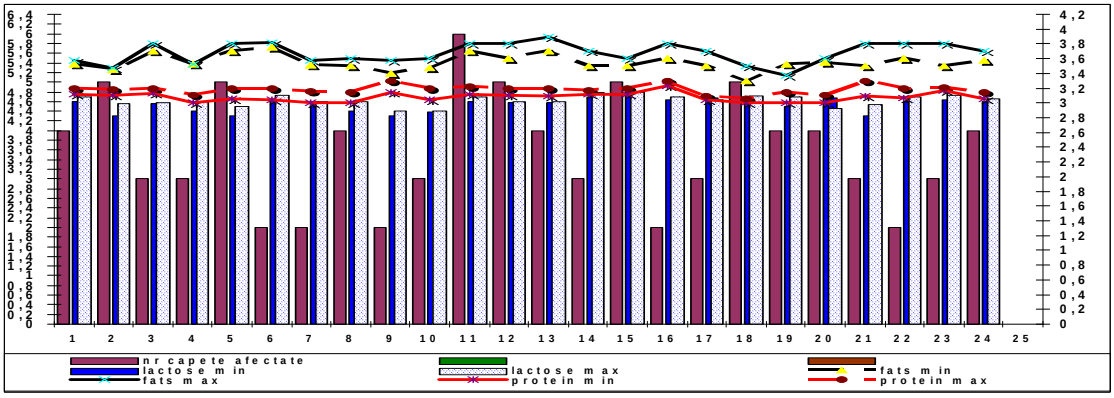

Fig. 7. Values of nutritional components in case of mastitic milk

Dairy cows with mastitis have found values between 202x1000 NCS/ml milk (F12)405x000 NCS/ml (F20)-Minimum and maximum: 230x1000 NCS/ml milk (F11)–493x1000 NCS/ml milk (F8), averaging between: 296±52.17x1000/ml milk and 368±0.006 x1000/ml milk.

Tab. 3

Determination of the degree of correlation between nutritional components of milk: protein, fat, lactose and somatic cell counts

Correlation	mamitic milk (NSC minimum)			mamitic milk (NSC maximum)			normal milk		
	(r)	(r^2)	P	(r)	(r^2)	P	(r)	(r^2)	P
NSC-protein	-0.30	0.093	0.14	-0.32	0.104	0.12	-0.35	0.12	0.08
NSC-fat	-0.31	0.096	0.13	-0.27	0.078	0.18	-0.27	0.07	0.19
NSC-lactose	-0.12	0.015	0.56	-0.24	0.060	0.24	-0.01	0.00	0.96

The results obtained in the main components of milk: protein, fat, lactose correlated with NSC/ml milk it is noted that between this parameters is exercise a negative correlation.

Correlations between NSC-protein show that the two characters cannot be determined with certainty about their level (Tab.3)

Correlation coefficients r=-0.35 for normal milk, r=-0.32 (maximum of NCS-protein milk for mastitis), r=-0.30 (minimum number of NCS-protein milk for mastitis) are medium.

Regarding the relationship between the NSC and the percentage of milk fat is found between the two parameters r=-0.27 correlation coefficient (normal milk), r=-0.27 (maximum number of NSC and % fat milk for mastitis), which indicating a weak link between the parameters studied.

A medium correlation encountered in the minimum number of NSC milk and % fat milk for mastitis r=-0.31. Among the parameters: r=-0.12 NSC-lactose (milk with minimum number of NSC and lactose milk for mastitis), r=-0.10 (normal milk), the values

obtained indicate weak connection between correlated parameters. A weak correlation is remarkable and if the maximum number of NSC milk and milk lactose in the case r=-0.24 mastitis.

CONCLUSIONS

From the evolution of nutritional parameters of normal milk and mastitis the following conclusions:

- milk fat has averaged between: 3.94±0.31% (F12) and 4.08±0.18% (F3). If mastitis milk is observed a decline at this parameter: 3.54±0.10% /3.6±0.13%.
- protein in milk from animals with healthy udder has values between: 3.09±0.10 (F13) - 3.29±0.06 (F10) and mastitis milk, up to 3.18±0.06 and 3.07±0.06 minimum.
- parameter variation for lactose from normally milk is situated between 4.80±0.16 (F1) and 5.14±0.02 (F7). A decline of values encountered in mastitis milk lactose content which is between: 4.5±0.14 and 4.62±0.11.

Technological quality of milk expressed in the NCS and the results, especially results indicate deficiencies in the level of hygiene in dairy farms, milking hygiene and milking technique approached, the situation of the firm quite close to the current situation in Romania.

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