

## RESEARCH ON THE QUALITY OF MILK PRODUCTION HUSBANDRY HOLDINGS FOR CATTLE BREEDING IN NEAMȚ COUNTY

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### Abstract

In this paper, the quality of milk production was analyzed in dairy cattle herds from 7 farms in Neamț County. For this, data from accredited associations were used to perform their own performance control (CPP), respectively the Association of Animal Breeders "Operator IA" Neamț, the Association of Cattle Breeders from Mureș County, as well as the data from the Genealogical Register. The quality of milk was assessed according to the seven specific indicators, as follows: somatic cell number (NCS), fat percentage (G%), protein percentage (P%), lactose proportion (L%), proportion of urea (U%), proportion of casein (C%) and the pH of the milk. The average daily milk production produced by the cows on these farms was also calculated (kg/head/day). The breeds raised on these farms are: Bălțată cu Negru Românească (BNR), Holstein, Brună de Maramureș and Bălțată Românească (BR). The best results of milk quality were obtained in Brună de Maramureș cows from farm 5 or Secuieni Neamț Agricultural Research and Development Station, the average values of the specific indicators on milk quality were as follows: NCS thousand / ml - 157.64, fat (%) - 4.64, protein (%) - 3.73, lactose (%) - 4.84, urea (%) - 23.37, casein (%) - 28.78, pH - 6.60.

**Key words:** dairy, cows, milk, quality, indicators

Milk is a product of white-yellow mammary glands, with a sweet taste and characteristic odor. The milk has a density of 1,026-1,034 g / cm<sup>3</sup> at a temperature of 20°C. Boils at 100.2°C and freezes at -0.55°C. From nutritional point of view, milk is considered a complete and complex food. It contains over 100 essential substances in human food, of which 20 amino acids, 10 fatty acids, 25 vitamins and 45 minerals (Silvaș, E., 1998). The chemical composition of cow's milk is quite variable, depending on several factors, but on average contains water 87.5%, total dry matter 12.5% consisting of basic nutrients in human nutrition.

The main components of the dry matter are represented by fat 3.3-4.5%, the average being 3.5%, protein 3.2-3.4%, lactose 4.8% and ash 1.0% (Usturoi M.G., 2007). However, milk is at the same time an excellent culture medium for microbes of all types, which is why obtaining, storing, processing, and consuming it must be carried out in perfect hygienic conditions. An important indicator in terms of milk quality is the pH of the milk for testing for impurities, damage, and signs of mastitis infection. Normal milk is presented as a weakly acidic liquid with a pH

ranging between 6.6-6.8 (Baul Simona, 2009). Regarding the number of somatic cells (NCS) / ml milk raw material <400,000, for an excellent sanitary situation <250,000 (Maciuc Vasile 2006).

### MATERIAL AND METHOD

In this paper, we analyzed the indices regarding the quality of milk in cattle registered in the control of their own performances exploited in seven farms in Neamț County. The farms studied were coded with Arabic numerals, as follows: farm 1 - I.F. Anghel Oana Brîndușa, farm 2 - P.F.A. Muraru Constantin Felix, farm 3 - Nacu Gheorghe, farm 4 - P.F.A. Olariu Neculai Marius, farm 5 - Secuieni Neamț Agricultural Research and Development Station, farm 6 - I.I. Ciucalău Aurelia Vasilica and farm 7 - P.F.A. Pîntea Ionela.

The studied herd was 152 cows of the following breeds: Bălțată cu Negru Românească, Holstein, Brună de Maramureș and Bălțată Românească. The primary data were extracted from the Association of Cattle Breeders from Mureș County, Association of Animal Breeders "Operator IA" Neamț from the Genealogical Register of the breed but also from the farms' records.

Statistical processing was performed following the average value and variability for 7

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characters, as follows: somatic cell number (NCS), fat percentage (G%), protein percentage (P%), lactose proportion (L%), urea proportion (U%), casein proportion (C%) and pH- the milk. The average daily milk production produced by the cows on these farms was also calculated (kg/animal head/day).

## RESULTS AND DISCUSSIONS

Table 1 presents the data on the mean value and variability of the number of somatic cells in the milk produced in the seven farms studied. It had the highest average value in farm 4,  $\bar{X} = 466.78 \pm 207.121$  thousand / milliliter of milk, the limits of variation being extremely wide, the minimum being 22.00 thousand / ml of milk and the maximum 1755.00 thousand / ml of milk.

Therefore, the value of the coefficient of variation is enormous, namely  $V\% = 133,11$ . The

best value of this indicator was registered in farm 5, respectively Secuieni Neamț Agricultural Research and Development Station where the average value of NCS was  $\bar{x} = 157.64 \pm 16,925$  thousand/milliliter.

The variation limits are quite wide, the minimum limit being 27.00 thousand / milliliter of milk, and the maximum of 521.00 thousand / milliliter. The much lower number of somatic cells in milk from cows on this farm is directly related to the feeding conditions and especially to the maintenance and sanitation conditions that are provided in this zootechnical farm.

It is specified that for farms 6 and 7 where the Bălțată Românească breed is bred, no data regarding this indicator were entered in the database.

Table 1

**Mean value and variability in somatic cell count (NCS) (thousand/ml)**

Indicators	$\bar{X}$	$\pm s \bar{x}$	s	V%	Minimum	Maximum
Farm 1	284.70	76.589	419.497	147.347	18.00	1761.00
Farm 2	362.50	41.105	82.209	22.678	270.00	450.00
Farm 3	392.26	97.609	543.465	138.548	7.00	2414.00
Farm 4	466.78	207.121	621.364	133.118	22.00	1755.00
Farm 5	157.64	16.925	116.031	73.606	27.00	521.00
Farm 6	0.00	0.000	0.000	0.000	0.00	0.00
Farm 7	0.00	0.000	0.000	0.000	0.00	0.00

Regarding the proportion of fat produced in the seven farms, it had a higher statistical average on the farm 5,  $\bar{x} = 4.64 \pm 0.151\%$ , a coefficient of variability of  $V\% = 13.450$  with variations ranging between 3.29% and 5.65%. The

lowest average value was registered in the farm 2,  $\bar{x} = 3.84 \pm 0.240\%$ , a high coefficient of variability of  $V\% = 24.997$  with variations between 1.82% and 5.09.

Table 2

**Average value and variability of fat percentage (G%) of milk on farms**

Indicators	$\bar{X}$	$\pm s \bar{x}$	s	V%	Minimum	Maximum
Farm 1	4.11	0.153	0.840	20.422	2.33	5.97
Farm 2	3.84	0.240	0.960	24.997	1.82	5.09
Farm 3	4.10	0.190	1.060	25.860	2.49	6.23
Farm 4	3.86	0.257	0.772	20.018	2.60	4.90
Farm 5	4.64	0.151	0.624	13.450	3.29	5.65
Farm 6	3.97	0.162	0.429	10.819	3.63	4.85
Farm 7	4.50	0.133	0.352	7.815	3.94	4.93

The data presented in Table 3 on milk protein obtained in the seven farms showed that the highest average value was registered on the farm 5,  $\bar{x} = 3.73 \pm 0.040\%$ , the coefficient of variation  $V\% = 6.139$ , with a minimum limit of 3,45% and a maximum of 4.17%. The lowest proportion of milk

protein occurred in farm 2 of  $\bar{x} = 3.32\% \pm 0.076\%$  with a coefficient of variability  $V\% = 12.689$ , with a minimum limit of 2.93 and a maximum of 4.95%.

Table 3

**Average value and variability of protein percentage (P%) of milk on farms**

Indicators	$\bar{X}$	$\pm s^x$	s	V%	Minimum	Maximum
Farm 1	3.53	0.085	0.436	12.351	2.90	4.40
Farm 2	3.32	0.076	0.422	12.689	2.93	4.95
Farm 3	3.37	0.085	0.338	10.056	2.78	4.15
Farm 4	3.36	0.137	0.412	12.270	2.73	3.87
Farm 5	3.73	0.040	0.229	6.139	3.45	4.17
Farm 6	3.35	0.166	0.438	13.092	2.96	4.28
Farm 7	3.48	0.075	0.199	5.703	3.10	3.76

The data from Table 4 regarding the proportion of lactose in milk obtained in the seven farms studied show that this indicator has the highest average value on farm 5,  $\bar{X} = 4.84 \pm 0.026\%$ , the coefficient of variability is small,  $V\% = 1.756$ , with the minimum limit of 4.77% and the

maximum limit of 5.06%. The lowest average value for the percentage of milk lactose was registered in farm 1,  $\bar{X} = 3.42 \pm 0.045\%$ , the coefficient of variation  $V\% = 5.370$ , with the minimum limit of 3.06 and the maximum of 4.04%.

Table 4

**Average value and variability of lactose percentage (L%) of milk on farms**

Indicators	$\bar{X}$	$\pm s^x$	s	V%	Minimum	Maximum
Farm 1	3.42	0.045	0.248	5.370	3.06	4.04
Farm 2	4.76	0.031	0.125	2.628	4.56	4.98
Farm 3	4.75	0.030	0.124	2.627	4.55	4.97
Farm 4	4.68	0.076	0.229	4.896	4.29	5.04
Farm 5	4.84	0.026	0.085	1.756	4.77	5.06
Farm 6	4.39	0.049	0.131	2.978	4.18	4.50
Farm 7	4.63	0.064	0.168	3.636	4.45	4.84

Data of the urea milk content obtained in the seven farms studied are presented in Table 5 which shows that the lowest average value was recorded on farm 7,  $\bar{X} = 22.44 \pm 2.377\%$ , the coefficient of variation  $V\% = 28,019$ , with the minimum limit of 16.40% and the maximum of

33.60%. The highest average value was registered in farm 1,  $\bar{X} = 38.46 \pm 2.755\%$ , the coefficient of variation is very high  $V\% = 33.899$ , with the minimum limit of 10.90% and the maximum of 53.90%.

Table 5

**Average value and variability proportion of urea (U%) of milk on farms**

Indicators	$\bar{X}$	$\pm s^x$	s	V%	Minimum	Maximum
Farm 1	38.46	2.755	13.037	33.899	10.90	53.90
Farm 2	29.10	1.881	7.524	25.854	18.40	45.90
Farm 3	34.93	1.478	8.229	23.557	18.62	47.30
Farm 4	26.49	2.620	7.859	29.669	13.30	35.20
Farm 5	23.37	0.684	5.762	24.653	11.00	39.90
Farm 6	33.17	4.448	11.768	35.478	19.70	46.10
Farm 7	22.44	2.377	6.288	28.019	16.40	33.60

An important indicator that characterizes the quality of milk is the proportion of casein, which is the main casein in milk, the data being presented in table 6 from which it can be seen that the highest average value was registered in the farm 5,  $\bar{X} = 28.78 \pm 0.877$ , the coefficient of variability  $V\% = 17.818$  with limits of variation between 22.59% and 36.71%.

The lowest average value was registered in the farm 1,  $\bar{X} = 27.69 \pm 0.878\%$ , the coefficient of

variability  $V\% = 11.867$ , the minimum limit being 22.70% and the maximum 32.75%. For farms 2, 6 and 7 no data on this indicator are recorded in the database.

Table 6

## Average value and variability proportion of casein (C%) of milk on farms

Indicators	$\bar{X}$	$\pm s^x$	s	V%	Minimum	Maximum
Farm 1	27.69	0.878	3.286	11.867	22.70	32.75
Farm 2	0.00	0.000	0.000	0.000	0.00	0.00
Farm 3	27.78	0.965	3.413	11.314	22.60	31.86
Farm 4	27.72	0.795	2.386	8.607	24.72	30.81
Farm 5	28.78	0.787	5.218	17.818	22.59	36.71
Farm 6	0.00	0.000	0.000	0.000	0.00	0.00
Farm 7	0.00	0.000	0.000	0.000	0.00	0.00

The data on milk acidity (pH) are presented in table 7 which shows that the highest average value was recorded on farm 3,  $\bar{X} = 6.86\% \pm 0.487\%$ , the coefficient of variation is  $V\% = 4.256$ , with the minimum limit of 6.46% and the maximum of 7.40%. The lowest average value was registered in farm 5,  $\bar{X}$

$= 6.60 \pm 0.012\%$ , the coefficient of variation  $V\% = 0.757\%$ , with the minimum limit of variation of 6.50% and the maximum of 6.70%. For farms 2, 6 and 7 no data on the pH value of milk are recorded in the database.

Table 7

## Mean value and variability for acidity (PH%) of milk in farms

Indicator	$\bar{X}$	$\pm s^x$	s	V%	Minimum	Maximum
Farm 1	6.70	0.014	0.054	0.806	6.61	6.82
Farm 2	0.00	0.000	0.000	0.000	0.00	0.00
Farm 3	6.86	0.487	0.292	4.256	6.46	7.40
Farm 4	6.72	0.027	0.082	1.220	6.61	6.85
Farm 5	6.60	0.012	0.050	0.757	6.50	6.70
Farm 6	0.00	0.000	0.000	0.000	0.00	0.00
Farm 7	0.00	0.000	0.000	0.000	0.00	0.00

Regarding the average milk production per day and per animal, the data are entered in table 8 and it can be seen that the best performance was obtained on farm 2 for the amount of milk produced per cow per day and per day, the statistical average was  $\bar{X} = 22.84 \pm 1.845$  kg, with wide limits between 19.00 kg and 32.70 kg, the

variability being in this case quite pronounced ( $V\% = 21.369$  kg).

The lowest quantitative milk production was recorded on farm 7 where the average value was  $\bar{X} = 13.80 \pm 0.863$  kg / animal head / day, with variations between 12.00 kg / animal head / day and 17.00 kg / animal head / day 53.90%.

Table 8

## Average value and variability for milk production per day and per animal (kg) on farms

Indicators	$\bar{X}$	$\pm s^x$	s	V%	Minimum	Maximum
Farm 1	18.05	1.316	7.208	39.926	7.00	32.40
Farm 2	22.84	1.845	4.881	21.369	19.00	32.70
Farm 3	20.03	0.877	6.074	30.323	14.00	36.06
Farm 4	16.72	1.787	5.361	32.062	8.40	24.08
Farm 5	19.66	1.382	5.595	28.456	17.00	36.06
Farm 6	19.22	0.635	3.534	18.386	11.20	27.20
Farm 7	13.80	0.863	2.283	16.545	12.00	17.00

## CONCLUSIONS

The following conclusions can be drawn from the study:

1. The best results in terms of milk quality were obtained in Brună de Maramureș cows from farm 5 or Secuieni Neamț Agricultural Research and Development Station, the average values of the specific indicators on milk quality were as follows: NCS thousand / ml 157.64, the much lower number of somatic cells present in the milk from cows on this farm is directly linked to the feeding conditions and in particular to the maintenance and sanitation conditions that are ensured in this zootechnical farm, fats (%) -4.64, protein (%) - 3.73, lactose (%) -4.84, urea (%) 35.00, casein (%) - 28.78, pH - 6.60.

2. If we take into account the number of somatic cells in the milk produced in the seven farms studied, it had the highest average value in farm 4,  $\bar{x} = 466.78 \pm 207.121$  thousand / ml with very distant limits of variation, the extremes being 22 thousand / ml and respectively 1755 thousand / ml. The coefficient of variability, in this case is extremely high and unnatural, namely 133.118% but also in farm 3 being  $\bar{x} = 392.26 \pm 97,609$  thousand / milliliter of milk, the variation limits being extremely wide, the minimum being 7.0 thousand / ml of milk and the maximum of 2414.0 thousand / ml of milk. The very high number of somatic milk cells produced on these two holdings betrays non-compliance with the hygiene conditions in cow shelters and milking parlors, as well as possible cases of mastitis or other udder diseases in cows. It is necessary to remedy these irregularities in the two farms because the cows with this condition, namely mastitis, give a smaller amount of milk and its composition is modified, with a negative influence on economic efficiency.

3. Regarding the fat content of milk obtained in the seven farms, it had a higher statistical average  $\bar{x} = 4.64 \pm 0.151\%$  in farm 5, where the breed of cattle is raised, Brună de Maramureș and the lowest average value of was registered on farm 2,  $\bar{x} = 3.84 \pm 0.240\%$  where a mixed herd of Bălțată cu Negru Românească and Holstein breeds grows. The coefficient of variability is high,  $V\% = 24,997$  with variations between 1.82% and 5.09%, which indicates the existence in farm 2 of a heterogeneous population of cows in terms of milk fat content, therefore requires special attention from the farmer in the selection and management of mating, because only on the basis of knowledge of individual performance (amount of milk, percentage of fat, percentage of protein) are chosen parents of the next generation.

4. For the protein content of the studied milk, it is found that the highest average value was registered in farm 5,  $\bar{x} = 3.73 \pm 0.040\%$ , respectively at the Neamț Agricultural Research and Development Station where the Brună de Maramureș breed is bred, where through the experiments performed in the field of nutrition - rations with nutritional value were established to ensure the nutrients in a balance corresponding to obtaining high and quality zootechnical productions.

5. Analyzing the quality of milk obtained in the seven farms studied in terms of casein content (C%), we find that the highest average value was recorded at farm 5,  $\bar{x} = 28.78 \pm 0.877\%$ , and the lowest average value at farm 1,  $\bar{x} = 27.69 \pm 0.888\%$ . The higher average value of this specific indicator, namely casein, which represents 82% of the total milk proteins obtained on the farm 5, in which the Bruna de Maramureș cattle breed is raised, defines the special quality of the cow's milk produced in this farm. Due to its high casein content, the milk obtained from cows of this breed is especially suitable for the cheese industry.

5. The data from the statistical processing on the milk fat and protein content reveal that the farmer who manages the livestock farm no. 2 does not have the necessary knowledge to be able to make the best decisions in order to improve productive performance in terms of milk quality, by selection, by the use in breeding of cows that produce milk with the highest percentage of fat and protein, and by using breeding bulls for this purpose. Also, in order to improve the phenotypic performance regarding the proportion of fat and protein in milk, it is necessary to improve the nutrition and feeding of dairy cows on this farm through the structure of rations, energy and protein intake and feeding technique.

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