RESEARCH ON COLLECTION AND VALORISATION OF MILK IN QUALITY CONDITIONS IN A CATTLE FARM

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Abstract

The present paper aims to highlight the results of the study on the collection and valorisation of milk in quality conditions. It is known that both internal factors and exploitation and environmental factors influence the quantitative and qualitative performances of cattle.50 cows belonging to the Fleckvieh breed and reared in semi intensive farming conditions were taken into study. Statistical processing was done on a computer software program, analysis of variance and covariance (S.A.V.C.). Analysing the data from the milk analysis reports, we can see that the maximum limit allowed for the NCS indicator is exceeded in the winter season (480.36x 1000 somatic cells/ml of milk),the maximum value recorded for this season being of 6737.00 x 1000 somatic cells /ml, in the other seasons the average values are within the maximum limit accepted by the European Community (EC) respectively of 400000 somatic cells/ml of milk. We can conclude that there are deficiencies in complying with the milking technique (training of the worker, preparation of the milking plant, preparation of the cow, etc), since there are cows in which NCS in milk exceeds the maximum limit allowed by the European Community.

Key words: *milk, collection, valorisation, quality, cattle, breed*

INTRODUCTION

Milk and milk products are an essential source of substances with a nutritional role, the main element with a nutritional role being calcium, but also a source of income for farmers and processors. Also, the dairy sector has an essential role in the global development of the economy through the fact that it forms links between the agricultural sector and the food industry. [1;2;3]

It is well known that fresh milk contains some bacteria and somatic cells. These are biological constituents of milk. The number of these biological constituents changes depending on production conditions, such as animal health and animal hygiene during milking, milk storage and transport. Milking, milking facilities, hygiene and other environmental factors such as season and high temperatures affect milk quality. The environment in and around the milking parlour largely determines the level of milk contamination. [4;5;6;7;8;9;10]

The demand for milk and dairy products in Romania has grown considerably in recent years due to the fact that both at European and national level the market for dairy products has had a significant evolution, also an important role was played by the fact that the population tends more and more towards a healthier diet. The main type of milk consumed in România is cow's milk, this being the basic food of the population, the average consumption being approximately 243 liters per capita. [11;12;13]

In view of the presented we proposed to conduct this studying which we followed the collection and valorisation of milk in quality conditions imposed by the European Union, in a cattle farm.

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MATERIAL AND METHOD

The research was conducted on a herd of cattle belonging to the Fleckvieh breed operated under the conditions of the didactic farm in Rediu, Iași county. It is known that both internal factors, exploitation and environmental factors influence the quantitative and qualitative performances of cattle. 50 cows reared in semi-intensive farming conditions were taken into study.

The cattle are reared in free stall housing and we distinguish three functional areas: rest, movement and feeding. The rest area has individual spaces and is delimited from the movement area by a threshold with a height of 25 cm. The movement area has a width for the movement of animals of 3 m. Evacuation of manure is done mechanically. Feeding takes place by means of the individual feeding front and with a locking system. Concentrates are rationally administered. Cows are milked in a fishbone milking parlour.

Several indicators regarding quantitative and qualitative milk production were analysed: milk Kg, fat %, fat Kg, protein %, protein Kg, total number of somatic cells (NCS ml x 1000), density g/cm^3, dry matter (D.M. %), urea mg/dl, lactose % and casein %. The values of the mentioned indicators were determined in the specialized laboratory of the company that collects the milk and the university laboratory. Were used LACTOSCAN and SOMACOUNT milk analysers.

The sample is collected in sterile plastic bottles of 10 ml, placed in a stand with 20 places, which is inserted into the rail support of the device; are extracted from each vial 3 ml of milk each and are transported through a hose to the incubator which is provided with 23 wells.

1 ml of milk and 1 ml of acridine-orange dye solution are mixed in each well. Incubation lasts 7-8 minutes at 45°C, after which it is withdrawn with a syringe and diluted with a solution containing 3 drops of TRITON X and 1 ml of ammonia/1 l of distilled water. It is then filtered through a 0.6 µ polyvinyl propylene filter membrane from which 1 ml is extracted which is sent to a laser reading device. The results are displayed on the monitor and printed on the printer. A raw number appears on the printer (2780 for example) representing the number of whole cells and broken cells, followed by colony forming units (CFU973, for example) which represents the total number of germs/ml. The result is multiplied by 1000.

Statistical processing was done on a computer software program, analysis of variance and covariance (S.A.V.C.). All data were statistically processed (s, $\pm s_{\bar{x}}$, V%) and summarized in tables and figures [14].

The analysis and interpretation of the results was correlated with the numerous observations made directly on the farm.

RESULTS

Table 1 shows the results regarding the productive performances of the studied herd, productions obtained in real lactation. Both the production of milk and the amount of fat and protein represent the quantitative part and the percentage of fat represents the qualitative part.

Figure 1 shows an upward trend in the regression line for milk quantity and fat quantity. From here, we understand that both characters (the amount of milk and fat) can be improved simultaneously and efficiently.

In table 2 the productive performances obtained are expressed in maturity equivalent (EM), to eliminate the error due to lactations. The same productive performances expressed in maturity equivalent (EM) are presented graphically in figure 2.

The productive performance obtained in this dairy cow farm is satisfactory, being the factor of increasing the profitability, when the genetic factor is successfully optimized with the technological environmental factor and the climatic one

Table 1 Statistic indicators regarding real milk production in the descendants from Fleckvieh breed, dairy cattle farm Rediu, ULS Iași

Parameters	n	$\bar{X}$	$\pm s_{\bar{x}}$	s	V%	Minim	Maxim
Milk Kg	50	6221.83	175.216	1357.221	21.814	2281	9458
Fat kg	50	264.78	7.553	58.506	22.096	94	405
Fat %	50	4.25	0.015	0.118	2.777	4	4.52
Protein kg	50	208.68	5.761	44.623	21.383	76	308
Protein%	50	3.36	0.012	0.092	2.739	3.19	3.74
DTL days	50	303.12	8.378	64.893	21.408	229	498

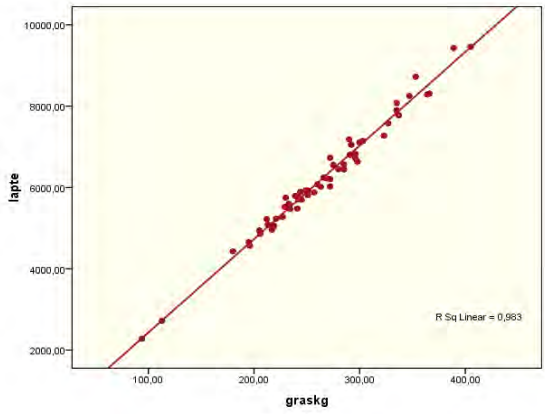

Fig. 1 Regression line for the quantity of milk kg and the quantity of fat kg

Table 2 Statistic indicators regarding milk production at ME in the descendants from Fleckvieh breed, dairy cattle farm Rediu, ULS Iași

Total Milk Production			Production Echivalent Maturity					Primiparous	DNL days	CI days	MR days
M. kg	F.%	P %	M. kg	F.kg	F%	P. kg	P. %	V.P. months			
6222	4.25	3.34	6436	274	4.26	214	3.34	30	303	331	66

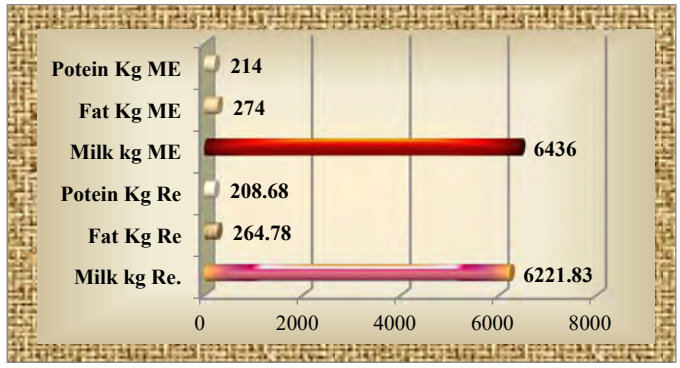

Fig. 2 Graphic representation of real milk production and ME

In table 3 and figure 3 it is present the quality of milk obtained according to the four seasons of the year. It is known that both the season and the genetic factors, respectively the technological and climatic environment, influenced the quantity, but also the quality of the milk.

Table 3 Statistic indicators regarding the quality of milk according to seasoning the descendants from Fleckvieh breed, dairy cattle farm Rediu, ULS Iași

Season	Indices	n	$\bar{X}$	$\pm s_{\bar{x}}$	s	V%	Minimum	Maximum
Spring	NSC ml x 1000	46	292.70	72.979	494.966	169.106	7.00	2216.00
	Fat %	46	3.66	0.117	0.793	21.643	2.11	5.84
	Protein %	46	3.33	0.070	0.477	14.315	2.55	4.56
	Lactose %	46	4.61	0.051	0.344	7.449	3.61	5.22
	TDM %	46	12.33	0.173	1.173	9.511	10.11	15.36
	Urea mg/dl	46	22.17	0.939	6.368	28.719	12.40	34.60
	Casein %	46	26.79	0.554	3.755	14.018	20.60	36.22
	Density g/cm^3	46	1030.71	0.204	1.386	0.134	1027.17	1034.04
Summer	NSC ml x 1000	38	129.97	30.143	185.812	142.961	20.00	798.00
	Fat %	38	4.12	0.099	0.609	14.780	2.73	5.73
	Protein %	38	3.39	0.060	0.368	10.852	2.58	4.31
	Lactose %	38	4.78	0.021	0.129	2.689	4.49	5.02
	SUT %	38	12.72	0.124	0.765	6.010	11.10	15.52
	Urea mg/dl	38	33.82	0.971	5.988	17.705	16.80	48.10
	Casein %	38	27.72	0.488	3.009	10.855	20.95	35.20
	Density g/cm^3	38	1031.43	0.129	0.798	0.077	1029.73	1032.82
Autumn	NCS ml x 1000	38	378.18	63.739	580.694	153.549	33.00	3302.00
	Fat %	38	4.61	0.137	1.246	27.000	2.13	8.20
	Protein %	38	3.96	0.059	0.534	13.505	2.99	4.89
	Lactose %	38	4.37	0.031	0.280	6.408	3.88	4.95
	TDM %	83	13.32	0.153	1.394	10.464	10.47	17.10
	Urea mg/dl	38	53.14	2.960	26.965	50.742	15.00	93.20
	Casein %	38	32.07	0.473	4.308	13.433	24.09	39.78
	Density g/cm^3	38	1030.73	0.169	1.536	0.149	1026.99	1033.47
Winter	NSCml x 1000	118	480.36	95.739	1039.99	216.504	13.00	6737
	Fat %	118	4.45	0.062	0.674	15.159	3.52	6.85
	Protein %	118	3.56	0.038	0.416	11.696	2.82	4.82
	Lactose %	118	4.77	0.024	0.261	5.461	3.73	5.14
	TDM %	118	13.93	0.104	1.132	8.126	10.62	16.27
	Urea mg/dl	118	38.96	1.419	15.417	39.568	13.40	71.00
	Casein %	118	30.98	0.303	3.293	10.633	23.35	38.49
	Density g/cm^3	181	1031.45	0.174	1.562	0.151	1026.29	1034.03

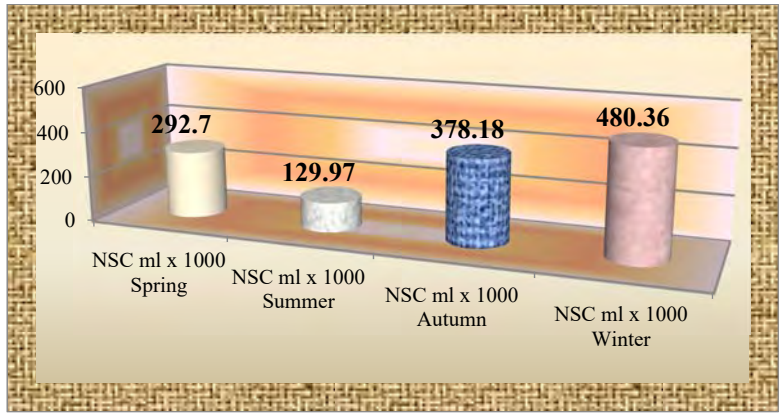

Fig. 3 NSC dynamics depending on the season

In table 4 we present the average value for the main milk quality indicators in the Fleckvieh herd under study.

Table 4 Statistic indicators regarding the quality of total milk in the descendants from Fleckvieh breed, dairy cattle farm Rediu, ULS Iași

Parameters	n	$\overline{X}$	$s_{\bar{x}}$	s	V%	Minimum	Maximum
NSC ml x 1000	285	373.59	45.883	774.598	207.338	7	6737
Fat %	285	4.33	0.056	0.943	21.81	2.71	5.7
Protein %	285	3.62	0.03	0.512	14.159	2.55	3.89
Lactose %	285	4.63	0.019	0.321	6.926	3.61	5.22
TDM %	285	13.33	0.078	1.32	9.904	10.11	17.1
Uree mg/dl	285	39.7	1.223	20.649	52.015	12.4	93.2
Casein %	285	30.18	0.246	4.15	13.749	20.6	39.78
Density g/cm^3	248	1031.07	0.093	1.466	0.142	1027.29	1034.04
PH %	285	6.85	0.011	0.181	2.637	6.57	7.36

DISCUSSION

After the centralization and statistical processing of the data, the results regarding the quantitative production of milk are presented in table 1.

The average milk production of the studied herd was of 6211.83±175.216 Kg, with values within the limits of 2281 and 9458 Kg and a coefficient of variation of 21 % which indicates a heterogeneity of the population studied regarding this character.

Regarding the average amount of fat recorded (Table 1), this was by264.78±7.553 Kg, recording minimum and maximum values between 94 and 405 Kg and a coefficient of variation of 22 % which indicates a heterogeneity of the studied herd since the amount of milk and the amount of fat are positively and strongly correlated in proportion to 99 % (0.99 %). The regression line for the amount of milk kg and the amount of fat kg has an ascending evolution and indicates a positive and strong correlation (figure 1). Correspondingly, the average fat percentage recorded in the descending 4.25±0.015 %,registering minimum and maximum values that oscillated between

4.00 and 4.52% and a coefficient of variation of 2.77 % which indicates that the studied herd is homogeneous for milk quality indicators.

As for the average protein percentage, it was 3.36±0.012 % with values ranging from 3.19 and 3.74 % and a coefficient of variation of 2.73 %.

Analyzing the duration of total lactation, it famed within the optimal limits with an average value of 303.12±8.378 days, recording minimum values of 229 days and maximums of 498 days, which shows that they are cows that do not fall within the optimal limits of lactation duration.

Quantitative analysis of milk production at maturity equivalent (ME) is presented in Table 2. Real milk production and equivalent maturity (ME) are close in value, the differences are not statistically significant (Figure 2).

By analysing Table 2, we find that the total average milk production of the studied herd was 6222 kg, and at equivalent maturity of 6436 kg, the percentage of fat was of 4.25%, and at equivalent maturity of 4.26 %, respectively the protein percentage was of 3.34 % both on the total amount and on maturity equivalent

The age at the first calving of the studied herd had an average value of 30 months, a value close to that mentioned in the literature of 28 months, the duration of normal lactation was 303 days, and the Calving interval recorded an average value of 331 days, while mammary repose was of 66 days.

In terms of microbiology, the number of somatic cells (NSC) together with the total number of germs (TNG), represent the most important indicators of milk quality. The number of somatic cells gives us information about the health of the animal, knowing that any infection of the mammary gland results in increased values of this indicator. Regarding this parameter, the maximum value allowed by both national and European legislation is 400,000 somatic cells/ml of milk.

After the centralization and statistical processing of the data related to the milk quality statistics by season for the studied descendants from the Fleckvieh breed, presented in table 3 and figure 3, the following aspects can be distinguished. Analyzing the data from the milk analysis reports, we can see that, in the winter season, the maximum limit allowed for the NSC indicator (480.36x 1000 somatic cells/ml of milk) is exceeded, the maximum value recorded for this season being 6737.00 x 1000 somatic cells/ml, in the other seasons the average values fall within the maximum limit accepted by the European Community (EC) respectively of 400000 somatic cells/ml of milk. However, in the other seasons as well, the maximum values for the studied NCS indicator are within the limits of 798 and 3302 somatic cells per ml x 1000.From here we can conclude that there are deficiencies in complying with the milking technique (training of the worker, preparation of the milking plant, preparation of the cow, etc), since there are cows in which NCS in milk exceeds the maximum limit allowed by the European Community. The rest of the indicators are very good and within the limits presented in the literature for the studied breed.[5].

The dry matter content of the milk varied between 12.33% in spring and 13.93% in the winter.

Regarding the average percentage of fat, it varied with values located between 3.66% in spring 4.61 % in autumn.

As for the average protein percentage, this indicator also varied similarly to the fat content, with values between 3.33% in spring and 3.96% in autumn.

A similar evolution is highlighted in the case of the other quality parameters of the milk, registering the lowest values in the spring season and the highest in the winter season.

Results for milk quality indices for the twelve months of the year and in the entire studied herd are presented in table 4.

Analyzing the results in table 4, we find that the average values of the studied indices fall within the optimal limits, indicating a quality milk (NSC 373.59 ml x 1000). However, the maximum value at NCS was 6737 ml x 1000. And at urea of 93.20 mg/dl, it indicates that they are animals that require increased attention and must be treated in time. Also, milking technology must be strictly followed in order to obtain quality and food safe milk.

CONCLUSIONS

After carrying out the study on the collection and utilization of milk in quality conditions, we can conclude:

1. The results obtained in this research confirm studies that highlight that exploitation technologies such as feeding, milking, facility hygiene but also other environmental factors such as season and high temperatures influence milk quality.

2. The milk quality indicators studied in the present study are influenced by the applied exploitation technology, the season and the ambient environment.

3. In order to respond to community requirements, farmers are called to follow both the heredity of the animals and the exploitation technologies that can largely solve the problem of milk quality.

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