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MILK PROFILE TEST - A TWO - YEAR EXPERIENCE

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For detection of most frequent bovine diseases that adversely affect production, bulk milk samples offer several advantages over blood analysis, including ease of use and cost-effectivness. The results of the analysis of collective milk sample enable the nutritional and health status determination of the herd. Discussions with producers, further analyses of husbandry measures, clinical examination of animals, blood and milk samples ensure an effective health and productive management of the herd. Our findings are based on the evaluation of 1547 weekly bulk milk samples. Milk samples from four districts in Slovenia were collected weekly on 30 farms through 1993 (n=12) / 1994 (n=18) and analyzed for fat, protein, lactose, urea, sodium, potassium, acetone concentrations and somatic cell count. A coefficient between fat/protein and protein/urea was also calculated. The model of multiple analyses of variance revealed that the results of milk analyses were statistically significantly ($P<0.05$) influenced particularly by the year of the investigation, farm, season (winter/summer ration) and to a lesser extent ($P>0.05$) by the health status of the udder (SCC x1000/ml) and ketolactia. The results of the milk profile test are useful for producers as well as all specialists involved in dairy industry, with emphasis on economics and cost reduction of production.

Key words: *milk, dairy cows, milk profile test, mastitis*

INTRODUCTION

Ruminants, especially dairy cows, are among the most important producers of high quality nutritional substances. Because they represent the main source of income for milk producers, the latter will look increasingly to veterinarians for advice and knowledge about how to achieve their production objectives.

"In Slovenia, milk delivery per dairy farm is not restricted as yet. The national trend are lower prices and increasing expenses, while it has not been agreed upon the end quality of milk or other manufacturing purposes. Currently, only few systems exist that can provide the welfare of animals in all respects (1)".

For extensive milk production highly selected cows are used: cows must be clinically normal, properly fed and well looked after. Good management of the dairies demands a constant cooperation with professional services which can help producers detect and prevent health problems. Therefore it is of the utmost importance to monitor and analyze the production data accurately. For monitoring the production and health status of cows

the Milk Profile Test (MLPT) (2,3,4) is implemented. Namely, milk sample examinations are performed on a fairly regular basis, collection is simple and an individual animal (monthly milk control), a herd (bulk milk sample) or a greater number of cows from a certain district (bulk tank) can be monitored. Milk is a diagnostic biological medium for detection of sub-clinical metabolic, deficiency, infectious, intoxication and parasitic diseases. Milk analyses enable a broader interpretation of the health status of cows, especially subclinical udder diseases; notably, counting of somatic cells in milk as an aid for mastitis detection. Inapparent udder diseases lead to sub-optimal milk production (3,5,6,7,8,9,10). The results of milk examinations are therefore useful for producers as well as consultants, selectionists, dairies and veterinarians and thus being of national significance (2, 3, 4, 10, 11, 12, 13, 14, 15, 16).

This paper discusses the findings of a two- year analysis of bulk milk samples on weekly basis.

MATERIAL AND METHODS

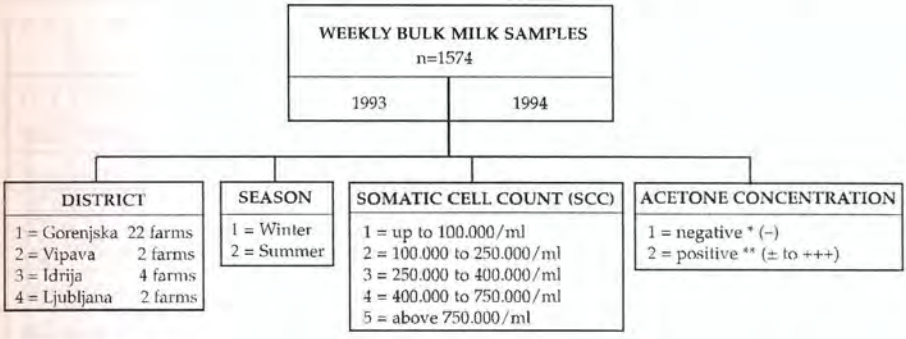
Bulk milk samples were collected weekly through 1993-94 on 30 dairy farms and analyzed for concentration of fat, protein, lactose, urea, acetone, somatic cells, sodium and potassium. Coefficient was calculated also between fat and protein content (Qf/p) and protein and urea content (Qp/u).

The obtained results of milk analyses were processed by the statistical package SAS (17).

Table 1: Investigated milk parameters and laboratory methods

No	Investigated parameters	Symbol	Unit	Lab. methods
1	Milk fat	Fat	%	Milko - Scan
2	Milk protein	Prot.	%	Milko - Scan
3	Lactose	Lactose	%	Milko - Scan
4	Milk urea	Urea	mmol/L	Cobas Mira
5	Sodium	Na	mmol/L	Cobas Mira - ISE Module
6	Potassium	K	mmol/L	Cobas Mira - ISE Module
7	Milk acetone	Acetone	mmol/L	O'Mooreu-s method
8	Somatic cell count	SCC	x 1000/ml	Fossomatic 360
9	Fat/protein coefficient	$Q_{f/p}$		
10	Protein/urea coefficient	$Q_{p/u}$		

Table 2: Distribution of farms with regard to year of investigation, region, feeding season, husbandry, somatic cell count and ketolactia.



* = *negative (-)*

** = *positive (± = 0,16 mmol/L; + = 0,17-0,42 mmol/L; ++ = 0,43-1,72 mmol/L; +++ > 1,72 mmol/L)*

The statistical model used was:

$$Y_{ijklmn} = \mu + L_i + K_j + S_k + SCC_l + Ac_m + e_{ijklmn}$$

where:

Y_{ijklmn} = observation resp. measured property ijklmn
μ = mean value of observations
L_i = influence of year i (i= 1993, 1994)
K_j = influence of farm (j= 1... 30)
S_k = influence of ration with regard to season (k= 1,2)
k=1 from 1. to 17. and from 40. to 52. week of experiment
k=2 from to 18. to 39. week of experiment
SCC_l = effect of SCC class (l= 1... 5)
Ac_m = effect of milk acetone concentration (m=1,2)
e_{ijklmn} = residual random (error)

RESULTS AND DISCUSSION

Table 3 presents mean values of parameters analyzed in weekly bulk milk samples with regard to the year of the research, feeding season, somatic cell count , acetone content and the highest resp. lowest average in 30 herds.

The most significant change was established by mean protein and urea content in 1994 as a consequence of milk price manipulation.

Table 3: Association of mean weekly values of bulk milk parameters (n=1541) with the year of the research, feeding season, state of udder, ketolactia and the lowest resp. highest obtained concentration in 30 herds

No	Effects	Fat %	Prot %	Lactos %	Urea mmol/L	Na mmol/L	K mmol/L	SCC x10^3	$Q_{p/u}$	$Q_{f/p}$
1	1993	3,8	3,16	4,76	4,76	-	-	378	0,72	1,23
	1994	3,8	3,27	4,77	5,38	22,9	38,9	323	0,67	1,19
2	Winter	3,9	3,27	4,76	4,69	22,8	38,8	331	0,75	1,21
	Summer	3,7	3,17	4,78	5,72	23,0	39,1	364	0,61	1,20
3	SCC 1*	3,8	3,27	4,85	4,88	21,8	38,8	77	0,73	1,17
	SCC 2*	3,8	3,25	4,79	5,16	22,3	38,9	177	0,70	1,19
	SCC 3*	3,8	3,22	4,76	5,12	22,8	39,0	319	0,69	1,21
	SCC 4*	3,8	3,19	4,73	5,13	23,9	38,9	532	0,67	1,22
	SCC 5*	4,0	3,18	4,69	5,24	25,5	38,8	1020	0,65	1,26
4	Aceton(	3,8	3,23	4,77	5,16	23,0	38,9	342	0,68	1,20
	Aceton(	3,9	3,17	4,77	4,83	22,3	38,7	377	0,71	1,26
5	Minim.*	3,5	3,02	4,61	4,02	21,1	38,1	91	0,55	1,12
	Max.	4,4	3,45	4,93	6,10	26,0	40,6	813	0,89	1,43
Total (n=30)		3,8	3,23	4,77	5,13	22,9	38,9	345	0,69	1,21

* 1 = up to 100.000sc/ml
2 = 100.000 to 250.000 sc/ml
3 = 250.000 to 400.000 sc/ml
4 = 400.000 to 750.000 sc/ml
5 = above 750.000 sc/ml
** = mean min./max. value in herds

A two-year monitoring of somatic cell count in bulk milk revealed that the obtained average cell count 345.000 sc/ml was too high. Namely, 30% of samples contained over 400.000 sc/ml. The results also demonstrated that from 30 monitored herds 8 exhibited weekly elevated cell count. On the basis of these findings we recommend that producers keep the somatic cell count in bulk milk below 250.000 sc/ml. It was concluded that the count exceeding 250.000 sc/ml indicated a greater number of animals with udder inflammation (10,18,19).

Table 3 also demonstrates that an elevated cell count in milk is closely related to a higher Na and urea level and that protein content decreases if somatic cell count increases.

Within the framework of the research the acetone content in bulk milk was also determined on a weekly basis and 141 (9,2%) positive responses were established. A detailed analysis has revealed that the acetone presence was mainly a reflection of feeding grass silage with elevated butyric acid content - the so-called alimentary resp. false ketosis. In this form of ketolactia the milk acetone was found in nearly all cows regardless of lactation period (20,21).

With the statistical model of the analysis of variance with 5 entries we calculated F-values and established statistical significance of individual factors affecting milk parameters. In Table 4 F-values for individual influences and determination coefficients (R^2) for milk content are presented.

Table 4: Demonstration of the results of the analysis of variance with 5 entries, determination coefficient (R^2) and coefficient of variation (CV)

Variability sources	Fat %	Prot. %	Lactose %	Urea mmol/L	Na mmol/L	K mmol/L	$Q_{p/u}$	$Q_{f/p}$
Farm	***	***	***	***	***	***	***	***
Year	**	***	*	***	!	!	***	***
Season	***	***	***	***	NS	**	***	**
SCC-class	***	NS	***	*	**	NS	NS	**
Ketolactia	NS	***	NS	NS	***	NS	NS	**
R^2 (%)	36,0	53,7	32,2	27,4	22,5	10,5	23,2	35,8
CV (%)	6,8	3,7	2,1	25,5	10,8	4,7	29,6	7,5

! = Na and K were measured only in 1994
** = P<0,05 ** = P<0,01 *** = P<0,001*
NS = insignificant

The investigated milk properties in weekly samples were statistically most significantly affected by the farm. This result is, we believe, quite objective because there are great differences among herds with regard to the management regime and health condition of dairy cows. Similar reports have been obtained also by other authors (1, 22, 23, 24,25). Season (temperature, humidity, husbandry) had also a significant effect on the majority of parameters, especially on fat, proteins and urea levels as well as somatic cell count. Through July, August and September the SCC was highest and the greatest frequency of mastitis was observed as well (10,19,26). The authors reported that the cell count was affected besides various causative agents of mastitis also by a whole range of other factors, among them the time of the year, and consequently alternations in the feeding and husbandry measures (1,10,18,19,25,27,28).

The obtained results confirm that the concentration of lactose and Na are closely related to somatic cell count. An increased cell count results in lactose content decrease, while Na concentration increases. This finding points out that the results of the MLP-test should be interpreted from various viewpoints. The most frequently established clinical state in cows is depressed milk secretion due to bacteriological inflammation of the mammary gland. In such cases an elevated cell count (>350.000 sc/ml), elevated Na content (>23,00 mmol/L) and decreased lactose content (<4,70%) were observed. Metabolic disorders in bulk milk samples associated with acetone content (ketolactia) were less frequently detected. The concentration of protein and Na was in such milk markedly lower. Acetone in milk appears in various forms of ketosis resp. impaired metabolism of carbohydrates and fats which is reflected at least at the initial stage in the compensated rumen resp. metabolic acidosis. The established acetone in bulk milk, lactose content about or below 4,70% and Na content below 22,5 mmol/L as well as suppressed milk secretion are sensitive predictors of metabolic disorders. Milk protein content is also decreased, whereas the somatic cell

count is below 250.000 sc/ml. Similar findings have been reported by other authors who suggested the same milk parameters as we monitored for evaluation of the energy and fat metabolism in dairy cows (4, 10, 20, 21, 29, 30, 31, 32, 33, 34, 35, 36).

Through our statistical model we managed to clarify a substantial part of variance. Determination coefficient (R^2) was highest by the protein percentage in milk and as much as 53,7% of variance was explained. Determination coefficients were rather high also by other milk concentrations (above 22,5%) with the exception of K (10,5%). Thus, the model is encompassing the majority of factors significantly affecting milk composition.

CONCLUSION

The most important observations derived from our study of dairy cows and bulk milk composition on 30 farms using the MLP-test method are the following:

1. The MLP-test was well accepted by the farmers in the study region. The results of systematic weekly bulk milk composition analyses were most valuable for dairy producers especially because they were immediately informed about their performance.

2. Collection of milk samples on a weekly basis and a continuous exchange of information played an important role between the producers and researches. Soon a constructive working atmosphere was created as the producers had reason to be interested in how they can achieve the optimal production under their current farm conditions.

3. The MLP-test with its wide applicability stimulates the farmers to closely monitor their animals because the results of various analyses indicate many potential factors that either hinder or promote the realization of their production goals.

4. Last but not least, the educational potential of the MLP-test should be emphasized as well. The producers and specialists, the beginners in the first place, are compelled to meticulously record and analyze the obtained data which is essential for making progress in modern preventive medicine in dairy herds.

FUTURE CONSIDERATIONS

The MLP-test is in its essence a monitoring of health, nutritional and production problems in dairy herds' management. Because of the great practical use of the results, the test should be broadly utilized in the future. New parameters will have to be studied and included for diagnostic, epidemiological and economic objectives (2,3,4,37). The milk progesterone concentration should be evaluated because of its diagnostic utility for pregnancy and other fertility problems assessment (3,38,39). Further, the MLP-test can be effectively used in epidemiology resp. prevention of some parasitic, bacteriological and virological diseases as well as determination of hampering and poisonous substances in milk (antibiotics, heavy metals, etc.) (5,40). Through modern diagnostic methods for assessment of antibodies in milk it is already possible to detect ostertagiasis, brucellosis, leucosis, BVD and winter bovine dysentery (3).

An integrated cooperation between producers, veterinarians, consultants, selectionists and supervising services will be needed to exhaust the total potential of the MLP-test.

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REFERENCES

1. ZADNIK T. in sod. Zaključno poročilo o enoletnem opazovanju, rezultatih in uporabnosti mlečno profilnega testa na področju Idrije in Vipave v letu 1994. Veterinarska fakulteta, Klinika za prežvekovalce. Ljubljana, 1995.

2. ZADNIK T., I. JAZBEC: Mlečno profilni test (MLPT):Pomen in uporabnost testa. Zbornik. Prvi Slovenski veterinarski kongres. Portorož, 18 -20 november, 1993, str. 5 -11.

3. EMANUELSON,U., L.ANDERSON, S.ALENIUS: Milk components as routine indicators of sub-clinical diseases and use in epidemiological research. Proceedings Society for Veterinary Epidemiology and Preventive Medicine (1989), 117-127.

4. DIRKSEN,G.: Kontrole von Stoffwechselstorungen beim Milchkuhen an hand von Milchparameter. Proceedings. XVIII World Buiatrics Congress, Bologna, 29 August - 2 September, 1994;35-47.

5. ZADNIK,T. : Vpliv transporta in shranjevanja goveje krvi ter seruma na rezultate hematoloških in biokemijskih parametrov. Ljubljana : Veterinarska fakulteta, 1991. Disertacija.

6. PAYNE,J.M., Sylvia PAYNE: The metabolic profile test. Oxford: University Press, 1987.

7. ČADONIČ-ŠPELIČ Vida: Vpliv različnega beljakovinskega obroka na sestavo goveje krvi in mleka. Ljubljana : Veterinarska fakulteta, 1993. Disertacija.

8. GREGOROVIĆ,V., F.SKUŠEK, I.JAZBEC : Subklinične presnovne motnje v čredah molznic. 3. Metodika dispanzerizacije molznic v SR Sloveniji. Zb.Biotehn. Fak. Univ. E. Kardelja, Vet. 18 (1981) 2, 105-112.

9. PENGOV,A., T. ZADNIK: Štetje somatskih celic v hlevskih vzorcih iz bazena. Zbornik. Prvi Slovenski veterinarski kongres. Portorož, 18 -20 november, 1993, str. 45 -51.

10. RADOSTITS OM, LESLIE KE, FETROW J. Herd health: Food animal production medicine. 2nd edition, WB Saunders Company 1994

11. Marija KLOPČIČ, J. POGAČAR, Sabina KNEHTL, Ivanka JUG: Poročilo o rezultatih AP kontrole za leto 1994/10. Biotehnička fakulteta, Oddelek za zootehniko, Domžale, 1995:1-39.

12. WIGGANS GR. Symposium: Meeting the information needs of the dairy industry. Meeting the needs at the national level for genetic evaluation and health monitoring. J Dairy Sci. 77;1994:1976-1983.

13. PIPAN V. Informacijski sistem za vodenje reprodukcije in zdravstvenega varstva govedi. Doktorska disertacija. Veterinarska fakulteta, Ljubljana 1994.

14. PETERS RR, CASSEL EK, VARNER MA, EICKELBERGER RC, VOUGH LR, MANSPEAKER JE, STEWART LE, WYSONG JW. A demonstration project of interdisciplinary dairy herd extension advising funded by Industry and users. 1. Implementation and Evaluation. J Dairy Sci. 77;1994:2438-2449.

15. PETERS RR, CASSEL EK, VARNER MA, DOUGLASS LW, VOUGH LR, MANSPEAKER JE, STEWART LE, WYSONG JW, EICKELBERGER RC. A demonstration project of interdisciplinary dairy herd extension advising funded by Industry and users. 2. Impact on herd performance. J Dairy Sci. 77;1994:2450-2460.

16. CASSEL EK, VOUGH LR, VARNER MA, EICKELBERGER RC, MANSPEAKER JE, STEWART LE, DOUGLASS LW, PETERS RR. A demonstration project of

interdisciplinary dairy herd extension advising funded by Industry and users. 3. Impact on Management practices. J Dairy Sci. 1994;2461-2476.

17. SAS/STAT User's guide, Version 6, Edition 4. 1989. SAS Inst. Inc., Cary, NC.

18. PENGOV A. Determinacija in vloga potencialnih mikrobnih povzročiteljev vimenskih vnetij. Ljubljana: Veterinarska fakulteta, 1995. Doktorska disertacija.

19. SCHUKKEN YH, BUURMAN J, GROMMERS FJ, et al. Population dynamics of bulk milk somatic cell counts. J Dairy Sci 1990;73;1350-1356.

20. Majda NEMEC, ZADNIK T, Martina KLINKON, JAZBEC I. Vsebnost acetona v hlevskih vzorcih mleka iz bazena. Zbornik. I. Slovenski veterinarski kongres - Portorož, 18 - 20. november 1993, str. 38-43.

21. ZADNIK T, PIRC B, FATUR B, JAZBEC I. Maslena kislina v travni silaži in pojav acetona v mleku. Zbornik predavanj. Posvetovanje o prehrani domačih živali. Zadravčevi-Erjavčevi dnevi. Radenci, 27 in 28. oktober 1994. str. 130 -38.

22. SCHOLL DT. An epidemiological study of dairy farm management and farm bulk tank milk protein concentration. Department of Herd Health and Reproduction State University of Utrecht: 1992. Thesis.

23. KLOPČIČ Marija, POGAČAR J. Rezultati AP kontrole za leto 1994. Kmetovalec. 63;1995(6):15-24.

24. The national Committee on Danish Cattle Husbandry. Urea content in milk. Controlling the protein supply of dairy cattle?. The Danish Agricultural Advisory Centre, AArhus. Extract from Report no.34, November 1993:22. .

25. GREGOROVIĆ V, JAZBEC I. Fizikalne i kemijske promijene mlijeka kod subkliničke protrahirane kisele indigestije. Vet. glasnik 1989;43:1115-1118.

26. GREGOROVIĆ V, JAZBEC I. Utjecaj truležne indigestije na pojavljanje akutnog koliformnog mastitisa u krava. 4. simpozij o suzbijanju mastitisa. Bled, 1983:39.

27. PENGOV A, ZADNIK T. Štetje somatskih celic v hlevskih vzorcih mleka iz bazena. Zbornik. I. Slovenski veterinarski kongres - Portorož, 18 - 20. november 1993, str. 45-52.

28. DOHOO IR, MEEK AH. Somatic cell counts in bovine milk. Can vet J 1982;23:119-125

29. HAGERT C. Kontinuierliche Kontrolle der Energie- und Eiweissversorgung der Milchkuh waehrend der Hochlaktation an Hand der Konzentrationen von Azeton, Harnstoff, Eiweiss und Fett in der Milch. Vet.Med.Diss. Muenchen, 1991.

30. PEN A. Fenomen naravne kislosti mleka. Zbornik predavanj. Posvetovanje o prehrani domačih živali. Zadravčevi- Erjavčevi dnevi. Radenci, 27 in 28. oktober 1994. str. 72-83.

31. ROSSOW N, STAUFENBIEL B, JACOBI U. Die Nutzung von Milchinhaltsstoffen fuer die Stoffwechseluberwachung bei Milchkuhen. Monatshefte fuer Veterinarmedizin, 45 (1990)19, 686 - 690.

32. BRAND A, SCHUKKEN YH, GOODGER WJ, HOGEVEEN H. A dairy herd health and production management protocol for hygienic milk quality. Proceedings. XVIII World Buiatrics Congress, Bologna, 29 August - 2 September, 1994;177-184.

33. LOBER U., MATTHES D., ROTTGER K., GAREISS G. Erfahrungen zur ursachlichen Klaerung ernahrungsbedingter Rohmilchqualitatsmaengel. Monatshefte fur Veterinaermedizin, 45(1990)12, 423-425.

34. PESTEVŠEK, U., J. ŠUST, D. LIKOSAR, A. VENGUŠT, S. PITAMIC: Vampova fermentacija pri kravah, krmljenih z velikim deležem voluminozne krme in njen vpliv na količino in kakovost mleka. Znanost in praksa v govedoreji, 1992;16: 119-12.

35. MIETTINEN PVA, SETČIĆ JJ. Relationships between subclinical ketosis, milk production and fertility in Finnish dairy cattle. Prev. Vet. Med. 1993;17:1-8.

36. SCHUKKEN YH, Van de GEER D, GROMMERS FJ, BRAND A. Assesing the repeatability of questionnaire data from dairy farms. Prev Vet Med 1989;7:31-38.

37. GIESECKE D, EHRENTREICH L, STANGASSINGER. Mammary and renal

excretion of purine metabolites in relation to energy intake and milk yield in dairy cows. J Dairy Sci 1994;77;2376-2381.

38. WATSON C. The use of milk progesterone samples for complete herd oestrous control. Proceedings. XVII World Buiatrics Congress, St. Poul, Minesota,31 August - 4 September, 1992;310-315.

39. ROPSTAD E, REFSTAD AO. Herd reproductive performance related to urea concentration in bulk milk. Acta. vet. Scand. 1987;28:55-63.

40. JENG SL, LEE SJ, LIN SY. Determination of cadmium and lead in raw milk by graphite furnace atomic absorption spectrophotometer. J Dairy Sci 1994;77:945-949.

ТЕСТ НА МЛЕКО - ДВЕГОДИШНО ИСКУСТВО

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За откривање на најчестите болести кај говедата кои негативно влијаат на нивните производни својства, анализата на примероци од групно млеко нуди неколку предности во однос на анализата на крвта, кои се однесуваат пред сé на едноставноста и ниските трошкови. Резултатите од анализите на групните млеко проби овозможуваат одредување на хранителниот и здравствениот статус на стадото. Разговорите со производителите, додатната анализа на фармското стопанисување, клиничкото испитување на животните и анализата на крвни и млеко проби, овозможуваат ефективно раководење со стадото. Нашите наоди се засноваат на 1547 неделно земани, групни млеко проби. Млеко пробите од 4 подрачја на Словенија беа собирани неделно од 30 фарми во периодот од 1993 (n=12), 1994 (n=18) и испитувани на масленост, содрдината на протеини, лактоза, уреа, натриум, калиум, концентрацијата на ацетон и број на соматски клетки. пресметани беа и соодносите маст/протеини и протеини/уреа. Со помош на моделот на мултипла анализа на варијансата беше утврдено дека годината на испитување, фармата и сезоната (зима лето) има статистички значително влијание ($P<0,05$) врз резултатите од анализата на млекото, додека здравствениот статус на вимето (SCCx1000/ml) и кетолакцијата имаат помало влијание ($P<0,05$). резултатите на тестот за млечен профил се корисни како за производителите, така и за сите специјалисти вклучени во млечната индустрија, посебно од гледна точка на економски причини.

Клучни зборови: *млеко, мледни крави, тест на млечен профил, маститис*