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MILK YIELD AND MILK COMPOSITION OF TECHNOLOGICAL GROUPS OF COWS IN THE DAIRY FARM LLP «KAMYSHENKA»

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Abstract

The article deals with the issues of milk productivity and milk composition of dairy cows divided into technological groups in order to increase milk productivity and improve the milk composition of cows of the dairy farm "Kamyshenka" LLP of the Akmola region. The authors present data on the structure of the herd, the specific weight of cows in which was insufficient for dairy farms.

The issues of monitoring the milk productivity of cows of all technological groups, divided by the level of milk yield, physiological indicators and health status, which showed an increase in productivity in comparison with last year's indicators, were also considered. A study of the chemical composition for the fat content and protein content of milk from dairy cows was also conducted.

At the same time, a study of the health of the udder of cows was conducted on the presence of somatic cells in milk on the analyzer "Somatos Mini". Somatic cell counts were within the normal range.

Keywords:dairy cattle breeding, milk productivity, technological groups, milk fat content, protein content, herd structure, analysis

Introduction

In accordance with the main strategic directions of the development of the Republic of Kazakhstan until 2050, large-scale tasks have been set to increase the production of livestock products, so the further development of dairy cattle breeding as the main supplier of milk, beef and leather raw materials requires the closest attention. Depending on the changing requirements for the types of management, production, as well as individual breeds of livestock, their properties and qualities are constantly being improved due to modern cultivation technologies, operating conditions, feeding and maintenance [1,2].

Dairy cattle breeding are one of the most labor-intensive industries in technological and economic terms, and improving its efficiency is the primary task of livestock workers. The growth rate of dairy cattle breeding is

accelerated by solving the main problems: breeding, feeding and technology of milk and meat production [2,3,4].

In recent years, the dairy cattle industry in the Republic of Kazakhstan as a whole has overcome the period of recovery in the number of dairy cattle (6.06 million heads, cattle, including 2.7 million cows).

At the same time, productivity indicators are successfully increasing, especially in those sectors where livestock breeding is carried out in agricultural enterprises, peasant farms, farms and combined farms of individual owners.

The process of stabilization of breeding work in all forms of management, including households, is being strengthened. In the coming years, the largest branch of animal husbandry - dairy cattle breeding-is expected to undergo deep qualitative transformations [5,6].

A number of indicators of milk quality alsodepend on the technology of its production of McGuffey, and the genetic potential of animals[7].

Similar data were obtained in the studies of Yilmaz et al in assessing theconditions for the maintenance of highly productive cows in easy assembled premises[8].

The design of the milking installation has a greatinfluence on the milking process, in particular the realization of the milk ejection reflex at cows, and on thequality of milk and its technological properties Vasseur et al., 2015[9].

In the technology of milk production, the technology of keeping cows has a strong influence on theproductivity of cows. Studies conducted in recent years Dascălu et al., 2011; Cielava, Jonkus, & Paura, 2017[10, 11].

Milking installations of the ‘Parallel’ and ‘Carousel’ type, which are implemented in Ukraine, differsignificantly from each other both by design and by milking technology, in particular, the technology ofplacement of cows, their preparation for milking and the control of the milking process [12].

Hovinenand Pyörälä and Toušová, Ducháček, Stádník, Ptáček, and Beran, studying the influenceof milking systems on the functional properties of cow's udder and the quality of milk, found that in order toincrease the effectiveness of the manifestation of the genetic potential of cows and improve the quality of milk, itis advisable to use milking equipment that provides timely stimulation of the milk ejection reflex, full dry milkingand rapid transportation & cooling of milk In their opinion, the most effective are the ‘Westphalia Arge’ and‘DeLaval’ milking installations[13,14].

Modern crisis phenomena in the domestic dairy cattle breeding have led to a decrease in production volumes and deterioration in the quality of its products. Therefore, the issue of increasing the productivity of the dairy herd and the grade of milk through the use of modern, innovative high-tech conditions for keeping, feeding and milking in commercial dairy farms remains relevant, which will contribute to the development of the industry, its competitiveness in the domestic and foreign markets [15].

The current stage of development of Kazakhstan is

characterized by the consistent promotion of the country into the world economic system, which can be successful only if the competitiveness of the products produced is ensured. This situation is particularly relevant for the agro-industrial complex and its livestock industry, which is faced with the task of accelerating the growth rate of gross agricultural production, improving its quality in order to meet the needs of the population within the country and increase the export opportunities of the republic.

The solution of the current problem is connected with the scientific support for the development of livestock industries, where agricultural science has achieved certain successes, the results of which are still not sufficiently in demand by agricultural producers.

So, the progress of domestic dairy farming should be based on the use of innovative intensive technologies and design-mode parameters of technical means that provide imitation of the physiological parameters of lactating animals of dairy breeds, which, ultimately, will make it possible to maximize the use of their genetic potential in commercial dairy farms. However, this is currently not well studied [16,17,18].

The zone of Northern Kazakhstan is the Shchuchinsk-Borovskaya resort area, where many sanatorium resorts, holiday homes, tourist bases are concentrated, this makes it necessary to fully ensure and more strictly take into account the quality of dairy products, which determined the direction and relevance of research on the dairy productivity of dairy cows [19, 20].

The introduction of automated process control systems in animal husbandry makes it possible to increase labor productivity by 1,2-2 times, reduce energy consumption by 30-40%, increase the productivity of animals by up to 20%, and significantly improve the working conditions of livestock breeders.

However, Russia is inferior to Western firms in terms of the labor intensity of production of basic animal products by 6-15 times, and in terms of the energy intensity of technical means in animal husbandry by 2,5-3 times. The radical restructuring of technologies and technical re-equipment of farms on the basis of advanced equipment, as well as automation tools, will reduce the cost of labor, energy, feed and other resources.

The aim of scientific research is the use of intensive technologies for keeping and feeding small-group maintenance of lactating animals of dairy breeds with the task of increasing their level of milk productivity.

The existing methods and technical means of implementing this task are not effective enough. Therefore, the development and improvement of technical means for monitoring and controlling technological processes in the individual service of animals on dairy farms and complexes was carried out within the framework of the budget program 267 "Increasing the availability of knowledge and scientific research" subprogram 101 "Program-targeted financing of scientific research and activities" on the specifics of 156 "Payment for consulting services and research" for 2018-2020, which is an

urgent task and is important for animal husbandry [21, 22].

Materials and methods of research

The research was carried out within the framework of the scientific and technical program "Development of intensive technologies in animal husbandry", under the project "Development of effective technologies in the dairy cattle industry in the Akmola region for 2018-2020", this work presents a fragment of research on milk yield and milk composition of technological groups of cows.

The work on the topic was carried out by the staff of the Department "Technology of Production and processing of livestock products" of the NCJSC of the S. SeifullinKazakh Agro-Technical University [23].

Scientific and economic experience was conducted in the conditions of a dairy farm of“Kamyshenka” LLP in the Astrakhan district of the Akmola region in 2019.

When organizing and managing technological processes, the object of the study was black-and-white cows, which were divided into seven technological groups according to the level of milk yield, physiological indicators, and health status. The materials for the research were the documents of the primary zootechnical accounting (from the IAS), as well as the results of experimental studies. For the analysis of milk productivity, control milks were carried out during the lactation period in all technological groups of cows with the determination of the chemical composition of milk in the laboratory of "Milk and Feed" of the S. Seifullin Kazakh Agro-Technical University.

The farm uses a milking machine “Elochka” milking unit with simultaneous milking of 24 cows in the first module and the ADM-8 with simultaneous milking of 8 cows in the second module of the dairy farm. During the control milking, the device of zootechnical control of milk UZKM-1 was used, Figure 1.

Figure 1.Sampling of milk with the help of UZKM-1 at the control milking in “Kamyshenka” LLP

The average samples were collected in a 20 ml container. Daily

samples of milk were examined according to the mass fraction of fat, protein on the milk analyzers Clever 1M", "Clever 2M" and the number of somatic cells on the express analyzer "Somatos-Mini", Figure 2.

Research results

In the complex of measures to increase the production of animal products, improve the quality and reduce their cost, it is of great importance to develop a progressive technology for keeping animals in production, placing them in livestock premises that meet sanitary and hygienic requirements and ensure the normal course of physiological processes in the body of animals.

Figure 2. The process of milk analysis on the analyzers Clever 1M", "Clever 2M", " Somatos-Mini»

On a dairy farm, a system of organizing milk production and herd reproduction is used, which provides for the division of a herd of cows, according to gender, age and physiological indicators. Repair of a herd of cows is carried out by heifers of 6-7 months of pregnancy. The structure of the herd of cattle of Kamyshenka LLP is presented below in Table 1.

Table1 – Structure of the cattle herd of “Kamyshenka”

№	Animalgroups	Numberofcattlefor 2019
1	Dairycows, including	434
2	Non-calving young cows, including	131
3	Heifersolderthan a year, including	140

4	Bull-calves older than a year, including	26
5	Heifers up to a year, including	116
6	Bull-calves up to a year, including	91
	Total	938

When analyzing Table 1 of the herd structure, conclusions can be drawn. As can be seen from Table 1, the specific weight of cows in the herd is 46.2% (434), which is insufficient for dairy cattle breeding (in dairy farms, the specific weight of cows is 50-60%). In this farm, the number of non-calving young cows per 100 cows corresponds to the norm (30), while the number of heifers older than a year is less than it should be to ensure the reproduction of the herd.

In addition, there are other sex-age groups: heifers up to a year (116), bull-calves (91), that is, there are all the main sex- age groups for the full turnover of the herd of the dairy farm "Kamyshenka" LLP of the Akmola region.

Based on the experience of foreign countries, the description of which states that cows in farms are divided into main categories by age, gender, biometrics, productivity, etc.Different groups of cows need different care and different parameters of feeding, veterinary medicine and maintenance. The term of use of dairy cows can be up to 10-12 years (on many industrial farms in the United States much less 2-3 lactation, mainly due to the fact that the technology of growing healthy young animals is well developed and it is not expensive to buy heifers, and a cow that begins to give less than 30 liters milk-already begins to spoil production indicators and such cows are rejected.

During the research on the farm, the cows were divided into 7 main groups according to the main criteria (productivity, physiological state and health status) in order to monitor the indicators of productivity, feeding level, live weight, reproductive ability, etc.

In order to study the milk productivity and the feeding process according to the norms and diets, taking into account the physiological state of the body, diets of all technological groups were formed to improve the technology of feed production and save money on feed costs.

Animal feeding rations were developed in accordance with the requirements of modern detailed feeding standards for lactating cows, taking into account the actual productivity and physiological state. The main ration (MR) of feeding experimental animals contained the following feed: grain hay, corn silage, grain waste, stranded, fine salt. The main groups are presented in Table 2.

Table 2–Main technological groups of cows

№	Name	Technologicalgroups	Number, heads	Averagedailyproductivity, kg
1	Milkproductiondepartm	1	81	25-30

	ent	2	80	20-25
		3	99	15-20
		4	80	10-15
2	yield	5	35	20-23
3	newly calved	6	32	15-20
4	sanitary zone	7	26	10-15

As can be seen from Table 2, dairy cows are divided into 7 technological groups, the bulk of which is concentrated in the milk production department of black-and-white cows in the amount of 341 heads. The division into groups made it possible to carry out differentiated feeding of animals, thereby bringing the diet closer to the physiological needs in terms of productivity and control of the rational use of feed and labor resources, analysis of the reproductive ability of cows of "Kamyshenka" LLP.

Lactating cows are kept separately, cows are separated, and new-bodied cows are kept separately. In the dead wood, the cows are transferred to the maternity ward at the eighth month of pregnancy. During this period, cows are fed mainly with hay, concentrated feed is not given.

In separate rooms (on separate farms), sick cows and quarantined cows are kept. Sick lactating cows are milked separately. The technology of individual feeding provides for the delivery of feed to each cow separately (additional feed), depending on its condition and productivity — this increases the milk yield.

The milk productivity of cows was taken into account on the basis of control milkings conducted once a month. The results of the study of milk productivity and milk composition are presented in Table 3.

Table 3 – Results of monitoring of milk productivity and milk composition of cows of the "Kamyshenka"LLP

№	Months	Daily milk yield, kg	fat %	protein %	Number of somatic cells, thousand units / ml
1	January	12,7±1,2	3,70±0,04	3,09±0,01	305,0±21,3
2	February	14,7±0,8	3,73±0,17	3,1±0,04	305,6±30,5
3	March	16,5±1,1	3,64±0,34	3,35±0,12	281,5±15,4
4	April	20,3±1,3	3,60±0,40	3,21±0,05	222,7±27,4
5	May	23,5±0,9	3,54±0,27	3,22±0,01	284,1±,44,1
6	June	29,8±0,7	3,6±0,51	3,30±0,02	247,3±22,4
7	July	21,1±1,1	3,68±0,48	3,30±0,36	256,1±36,1
8	August	16,2±0,9	3,70±0,56	3,20±0,26	291,5±65,1
9	September	14,3±1,4	3,71±0,12	3,3±0,31	305,1±32,1
10	October	11,3±1,2	3,80±0,44	3,3±0,23	321,2±32,1
On average		18,03±0,9	3,70±0,54	3,23±022	282,1±29,2

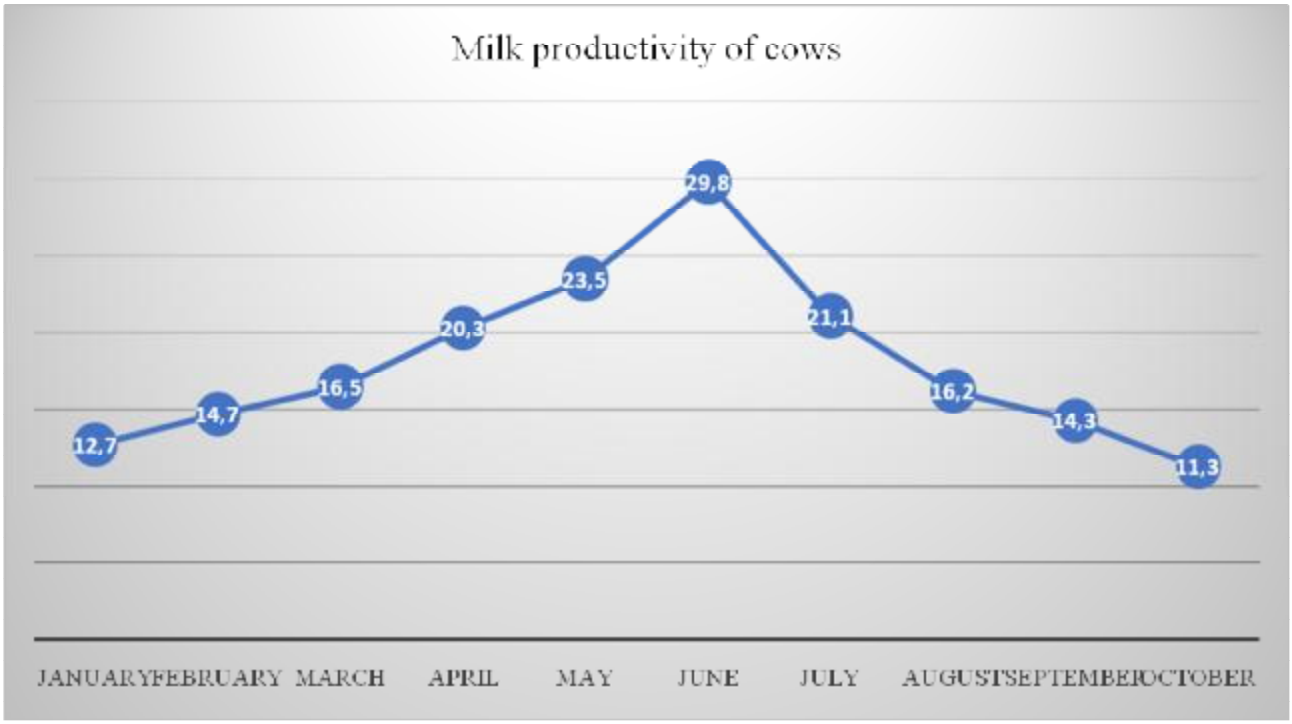

Figure 3. Milk productivity of cows on average per lactation per herd

According to Table 3 and Figure 3, we can see that the productivity of cows during lactation on average increased from 11.3 to 29.8 kg and averaged 18.03 kg of milk. The peak of milk productivity in the average herd is observed in the month of June, which is most likely due to an increase in the consumption of juicy green mass. The average dairy productivity of the herd is 5460 kg, which is 11% more than in the previous year. The fat content of the milk varied between 3.35% - 3.8% and averaged 3.7% , and the protein content ranged from 3.09% to 3.35% and averaged 3.23%, respectively. At the same time, the number of somatic cells, thousand units/ml was on average 282.1 thousand units/ml, which corresponds to the norm.

Conclusion

The analysis of the herd structure showed that the specific weight of cows in the herd is 46.2 % (428), which is insufficient for dairy cattle breeding (in dairy farms, the specific weight of cows is 50-60%). In this farm, the number of heifers per 100 cows corresponds to the norm (30), while the number of heifers older than a year is less than it should be to ensure the reproduction of the herd.

The dairy cows of the herd are divided into 7 technological groups, the main mass of cows is concentrated in the shop of milk production of cows of black-and-white and Simmental breeds in the amount of 341 heads, the division into groups allowed to control the milk productivity and quality of

milk of cows on the dairy farm of "Kamyshenka" LLP.

The productivity of lactation on average for all technological groups increases from 11.3 to 29.8 kg. The fat content of the milk averaged 3.7% and the protein content was 3.23%. At the same time, the number of somatic cells was in the range of 282.1 thousand units/ml, which corresponds to the norm.

The results of the research can be used for application by specialists and employees of farms of various forms of ownership and researchers.

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«КАМЫШЕНКА» ЖШС СТФ СИЫРЛАРЫНЫҢ ТЕХНОЛОГИЯЛЫҚ ТОПТАРЫНЫҢ СҮТ ӨНІМДІЛІГІ ЖӘНЕ СҮТ ҚҰРАМЫ»

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Түйін

Мақалада сүт өнімділігін арттыру және «Камышенка» ЖШС сүтті-тауарлы фермасы сүтінің құрамын жақсарту мақсатында технологиялық топтарға бөлінген сиырлардың сүт өнімділігі мен сүтінің құрамы қарастырылған. Авторлар табынның құрылымы бойынша деректерді ұсынды, онда сиырлардың үлес салмағы сүт фермалары үшін жеткіліксіз және 46,2% құрады.

Сиырлардың сүт өнімділігінің мониторингі орта есеппен табын бойынша сауым маусымы үшін 5460 кг деңгейінде болды, бұл өткен көрсеткіштермен

салыстырғанда 11% - ға өскенін көрсетті. Сүттің майлылығы 3,7% және ақуыз мөлшері 3,23% құрайды. Сонымен қатар соматикалық жасушалардың саны, мың бірлік/мл 282,1 мың бірлік/мл шегінде болды, бұл нормаға сәйкес келеді.

Кілт сөздер: сүтті ірі қара шаруашылығы,сүт өнімділігі, технологиялық топтар, сүттің майлылығы, ақуыздылығы, табын құрылымы, талдау

МОЛОЧНАЯ ПРОДУКТИВНОСТЬ И СОСТАВ МОЛОКА ТЕХНОЛОГИЧЕСКИХ ГРУПП КОРОВ МТФ ТОО «КАМЫШЕНКА»

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Аннотация

В статье рассмотрена молочная продуктивность и состав молока коров, разделенных на технологические группы с целью повышения молочной продуктивности и улучшения состава молока коровмолочно-товарной фермы ТОО «Камышенка»Акмолинской области. Авторами представлены данные по структуре стада удельный вес коров,в которой является недостаточным для молочных хозяйств и составил 46,2%.

Мониторинг молочной продуктивности коров показал, что удой в среднем был на уровне 5460 кг за лактацию по стаду, что показало увеличение на 11% в сравнении с прошлогодними показателями. Жирность молока в пределах 3,7% и белковость 3,23% соответственно. Вместе с тем, количество соматических клеток, тыс. ед/мл было в пределах 282,1 тыс. ед/мл, что соответствует норме.

Ключевые слова:молочное скотоводство,молочная продуктивность, технологические группы, жирность молока, белковость, структура стада, анализ