

The reproductive system of breast organs in cows and evaluation the function using a mineral adaptogen

Vera M. Usevich^{1,*}, Mary N. Drozd¹, and Alexandr N. Rusinov²

¹Federal State Budgetary Educational Institution of Higher Education Ural State Agrarian University, Yekaterinburg, Russia

²Limited Liability Company "Veterinary Technologies", Yekaterinburg, Russia

Abstract. Infertility problems still remain an urgent task of practical veterinary medicine. There are many drugs known to have an effect on the organs of the reproductive system, but the search for universal remedies is a priority. The effectiveness of drugs that prevent infertility can be assessed by reducing infertility days and reducing the cost of purchasing sperm products. Restoration, enhancement and prolongation of lactation also ensures the effectiveness of dairy cattle breeding. Therefore, the search for effective means of prevention and treatment is the purpose of this study. The article describes the results of research on the effect of mineral adaptogen on the function of the reproductive system and breast organs in cows. The article presents the results of changes in hematological and biochemical blood tests in cows receiving adaptogen during the dry period and the state of the reproductive system, breast and milk productivity, against the background of taking adaptogen. As a result of the conducted research, a decrease in the incidence of reproductive organs and udders was noted. Reduction of complications in childbirth and the postpartum period. A decrease in the incidence of neonatal pathology in newborn calves was noted. In addition, an increase in dairy productivity.

1 Introduction

Infertility in farm animals, a decrease in all types of productivity, remains the main focus in practical veterinary medicine to date. In addition, increasing dairy productivity and prolonging productive longevity ensures the efficiency of industrial livestock farming. In this regard, the search for effective means of preventing and treating infertility remains an urgent issue. It is especially important to find a complex drug that has a multidirectional effect. Therefore, the search for such funds attracts the attention of veterinary specialists. Various adaptogens that increase the natural resistance of animals are of great importance in this regard.

* Corresponding author: vus5@yandex.ru

2 Literature review

Until recently, interest in feed additives of domestic production has not been lowed, which have a stimulating effect on the body of animals, contribute to increasing meat and dairy productivity, as well as increasing productive longevity. Currently, there are known feed additives that increase the natural resistance of animals, containing biologically active substances and a complex of macro- and microelements. Such feed additives include the feed mineral supplement (FMS) WS-VIT, peat-sapropel concentrate (PSC), etc. FMS WS-VIT is an artificial zeolite obtained after technological processing of a by-product of aluminum production from bauxite enriched with stabilized iodine. PSC has pronounced sorption properties, enriches the animal body with minerals by the ion exchange mechanism, causes an increase in natural resistance. Previously conducted studies allow it to be attributed to mineral adaptogens. Adaptogens belong to the group of biologically active substances (BAS), they are introduced into the diet in the form of feed additives. Adaptogens have high bioavailability; are safe for the body; enhance the body's adaptation to any stressful effects. Due to their low cost and high therapeutic, preventive and economic efficiency, interest in their use is increasing. [1-9]

The effectiveness of adaptogens ensures an increase in productivity and resistance of animals and poultry. In this regard, the aim of the study is to determine the effectiveness of the mineral adaptogen in maintaining the function of the reproductive system and breast organs in cows.

To achieve this goal, the following tasks were set:

- to assess the clinical condition and parameters of hematological and biochemical parameters of blood during the study period before and after feeding the mineral adaptogen;
- evaluate milk yield before and after feeding the mineral adaptogen;
- to evaluate the effect on the organs of the reproductive system in the post-hotel period and the incidence of breast cancer.

3 Materials and methods

The research was carried out at the Department of Infectious and Non-infectious Pathology of the Ural State Agrarian University and in the conditions of an educational farm on cows of a black-and-white Holstein breed. Laboratory hematological studies and determination of biochemical status were carried out in a licensed laboratory of the Federal State Budgetary Institution, Federal State Budgetary Scientific Institution Ural Federal Agrarian Research Center of the Ural Branch of the Russian Academy of Sciences.

Two groups of cows were selected for the research according to the principle of analogues of 10 heads each. The average age is 5 years, the average annual milk yield is 6,500 kg, and the average daily milk yield is 19 kg of milk. The studies were carried out at the end of the dry period and in the initial period of lactation. During the study period, the type of feeding is roughly concentrated. Hematological and biochemical parameters were determined in all the studied animals. Blood tests were performed using generally accepted techniques on the automatic analyzer Chem Well-2910 Combi by the company Awawens Technology (USA). The average daily milk yields were determined every 10 days based on the results of control milking. Throughout the entire period of the study, the technological process of maintenance and feeding and the drinking regime were the same. The control group – the animals received only a feed ration according to the farm scheme. The experimental group, in addition to the main feed ration according to the farm scheme, additionally received the mineral adaptogen (MA) PSC WS-VIT with mixed feed (Table 1).

Table 1. Scheme of experience

Groups	Age, years	Feed ration according to the farm scheme	mineral adaptogen with mixed feed
1 experienced	5	+	+
2 control	5	+	—

Animals of the 1st experimental group were fed mineral adaptogen (MA) 1 time a day with compound feed at a dose of 150 g per head, for 30 days. Blood sampling for the study was carried out twice: the first time 1 day before feeding the adaptogen, and the second time 30 days after the start of feeding the mineral adaptogen. Blood was taken at one time of a day from animals at rest. After a daily clinical examination of the cows, the results were recorded in the observation log. The hematological and biochemical results are shown in Tables 2, 3.

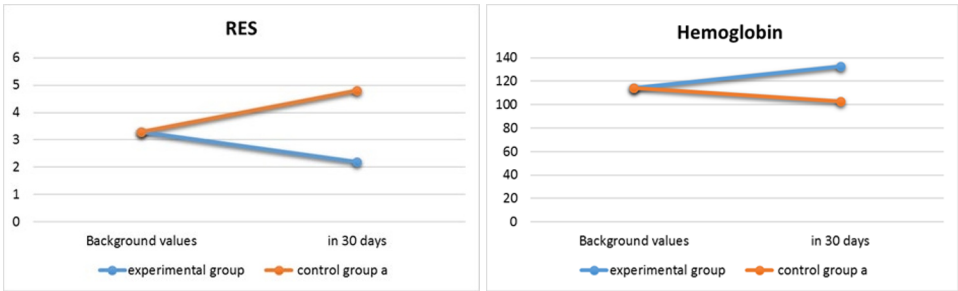
4 Results research

Indicators of hematological status in cows are presented in Table 2.

Table 2. Hematological status of cows in the dry period 30 days before calving when feeding a Feed mineral supplement - mineral adaptogen

Indicators	Units of measurement	Standard interval	Background values, n=20	An experimental group in 30 days, n=10	The control group after 30 days, n=10
RES	mm/h	0.5-1.5	3.3±0.2	2.19±0.2*	4.8±0.3*
Hemoglobin	g/l	89.3-121.3	114.0±1.0	132.8±2.0**	102.75±2.0*
Hematocrit	%	30-40	30±5	27.8±0.3	30.0±0.5
Red blood cells	10 ¹² /l	5.8-7.4	5.7±0.6	6.28±0.6*	5.34±0.5
White blood cells	10 ⁹ /l	7.93-8.13	7.66±0.6	8.64±0.6	6.15±0.5*
Basophils	%	0-2	0±0	0±0	0±0
Eosinophils	%	5.0-8.0	5.3±0.4	4.6±0.4	2.5±0.5
Rod-shaped neutrophils	%	2.0-5.0	1±0.1	1.0±0.1	1.0±0.1
Segmented neutrophils	%	20.0-35.0	50.4±0.5	35.2±0.1**	49.5±0.1
Lymphocytes	%	40.0-65.0	44.5±0.5	57.0±0.5	46.75±0.5**
Monocytes	%	2.0-7.0	0±0	0.8±0.5 *	0.25±0.5*

*P≤0.5; ** P≤0.05



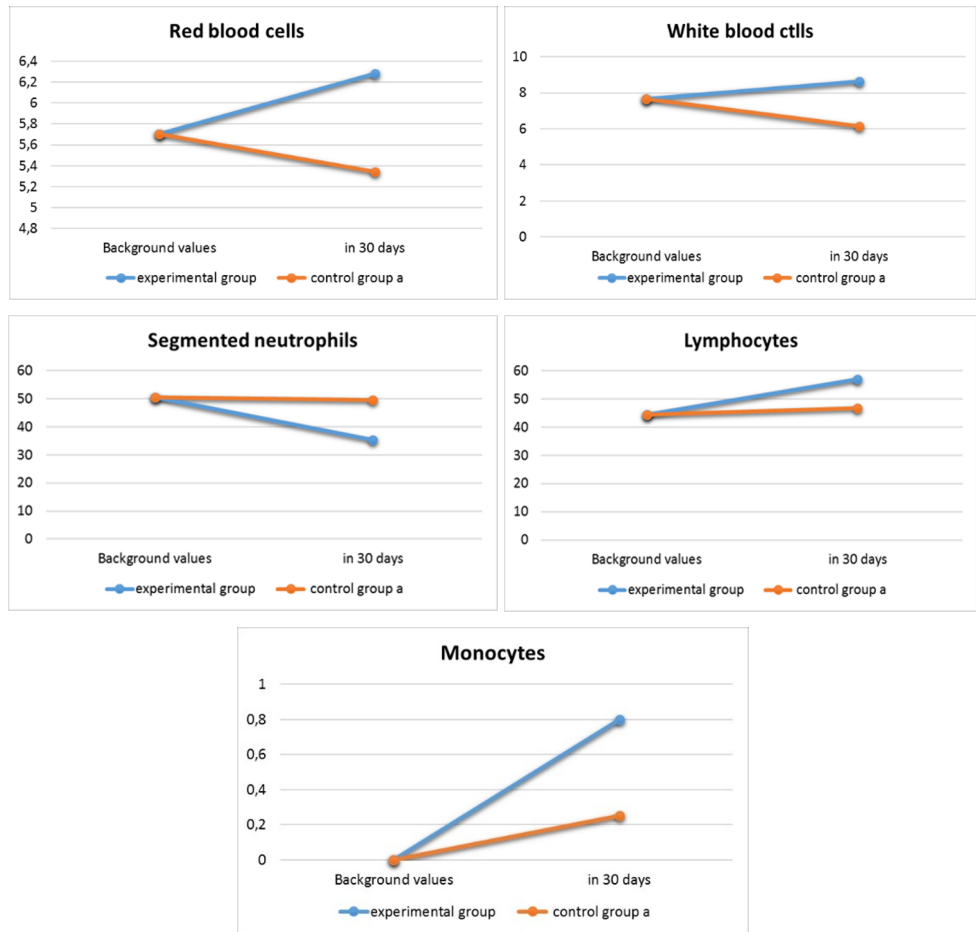


Fig. 1. Hematological profile of the deep-bed cows of the educational farm

When conducting studies on the use of MA, pregnant cows were noted 30 days before calving that the cows had normalized hematological parameters.

In the experimental group, an increase in erythrocytes was noted by 8.2%, hemoglobin by 16%, leukocytes by 9.6%, lymphocytes by 14.3%, monocytes by 80% and a decrease in eosinophils by 41%. An increase in leukocytes in cows in the experimental group indicates an increase in body resistance, and a decrease in eosinophils indicates a decrease in allergization.

It is also possible to note a decrease in segmented neutrophils, which indicates active leukopoiesis, a decrease in phagocytosis and a decrease in inflammatory processes in the body of animals. In addition, these cows had a decrease in ESR, which indicates the positive effect of the Mineral adaptogen (MA) BS-VIT. In animals of the experimental group, after feeding MA, an increase in the number of erythrocytes and hemoglobin, within the standard interval, is a sign of improved metabolism.

In animals of the control group, there is an increase in ESR, which is characteristic of inflammatory processes, liver diseases or intoxication of the body. A decrease in their number of red blood cells – by 5.6%, and, accordingly, hemoglobin – by 3.9%, is characteristic of the development of anemic syndrome. In addition, a decrease in the number of leukocytes by 17.3% and eosinophils by 10.7% is a sign of a decrease in resistance. At the same time, an increase in the number of lymphocytes – by 5.2% and

monocytes – by 25% was noted in these animals, which can be characterized as a manifestation of chronic inflammatory processes in the animal body. The interval is a sign of improved metabolism.

According to hematological indicators, signs of anemia, allergization of the body, as well as chronic inflammatory processes were revealed in animals before feeding the mineral adaptogen. After the application of the mineral adaptogen in cows, homeostasis indicators tend to average reference values, which is characterized as positive dynamics and increased immunity.

Changes in biochemical parameters in the blood of animals during the study period are shown in Table 3.

Table 3. Biochemical status of cows in the dry period 30 days before calving when feeding a feed mineral additive - mineral adaptogen

Indicators	Units of measurement	Standard interval	Background values, n=20	An experimental group in 30 days, n=10	The control group after 30 days, n=10
AlAT	U/l	12.0 – 35.0	35.0±1.0	35.0±1.5	46.0±1.0**
Albumin	g/l	29.0 – 38.0	31.7±1.0	32±1.0	30±2.2
AsAT	U/l	45.0 – 110.0	60.5±2.0	82.4±2.4*	72.3±3.2*
Glucose	mmol/l	1.9-3.8	2.7±0.3	3.4±0.5	4.2±0.4**
Creatinine	mcmol/l	56.0 – 162.0	88.9±2.5	82.2±2.0	80.5±2.5
Urea	mmol/l	2.0 – 7.5	3.8±0.5	2.26±0.3*	2.4±0.3*
Total protein	g/l	62.0 – 82.0	68.2±3.0	68±2.5	65±3.3
Total bilirubin	mcmol/l	0.0 – 8.5	1.1±0	6.4±	6.54±
Alkaline phosphatase	U/l	20.0 – 164.0	76±2.5	71±3.0	189±4.5**
γ- GGT	U/l	4.9 – 26.0	12.5±1.2	9.92±1.0*	44.7±2.0**
LDG	U/l	309.0 – 1200.0	745.5±23.5	808.9±17.5	703.9±16.5
Cholinesterase	U/l	More than 450.0	2519.5±30.0	1852±*	2380.3±*
Globulins	g/l	25.0 – 41.0	37±1.5	36.1±2.0	34.3±2.5
Albumins/globulins	c. u.	-	0.88±0.4	0.9±0.3	0.9±0.3

*P≤0.5; ** P≤0.05

Against the background of taking mineral adaptogen, pregnant cows of the experimental group showed a decrease in creatinine – by 1.33%, urea – by 43.5%, total protein – by 2.2%, globulins – by 5%, cholinesterase - by 30.9%, alkaline phosphatase – by 9%, γ-GGT – by 17.3%, but a decrease in according to all indicators, it occurred within the standard interval. In addition, there was an increase in total bilirubin – by 640%, albumin – by 1.6%, LDH - by 3.3%, glucose – by 13.3%, albumin/globulin – by 7.1%, AsAT – by 37.3%.

In the control group, there was an increase in AsAT – by 18.5%, glucose – by 7.5%, total bilirubin – by 210%, alkaline phosphatase – by 155%, γ-GGT – by 244%, cholinesterase - by 0.9%, and a decrease in: total protein – by 3%, albumin – by 6.33%, globulin – by 2%. albumin – by 6.33%, creatinine – by 14.5%, urea – by 33.3%, LDH - by 0.6%, albumin/globulin – by 2.1% (Table 3).

A decrease in serum urea in cows at the end of the study in both groups may indicate that there is intensive fetal growth. An increase in serum cholinesterase levels in cows of the control group may indicate inflammatory processes in the small intestine. In the experimental group, on the contrary, we observe a decrease in this indicator, which may be a sign of the beneficial effect of the mineral adaptogen, which, being an enterosorbent, removes toxins from the gastrointestinal tract.

Also, an increase in alkaline phosphatase and γ -GGT in the control group indicates the development of cholestatic syndrome. In addition, an increase in these indicators in the control and experimental groups may be a sign of the development of pathological processes in the liver. At the end of the experiment, an increase in glucose in cows of the control group may also indicate the presence of chronic liver diseases, while in cows of the experimental group this indicator remains within the reference values.

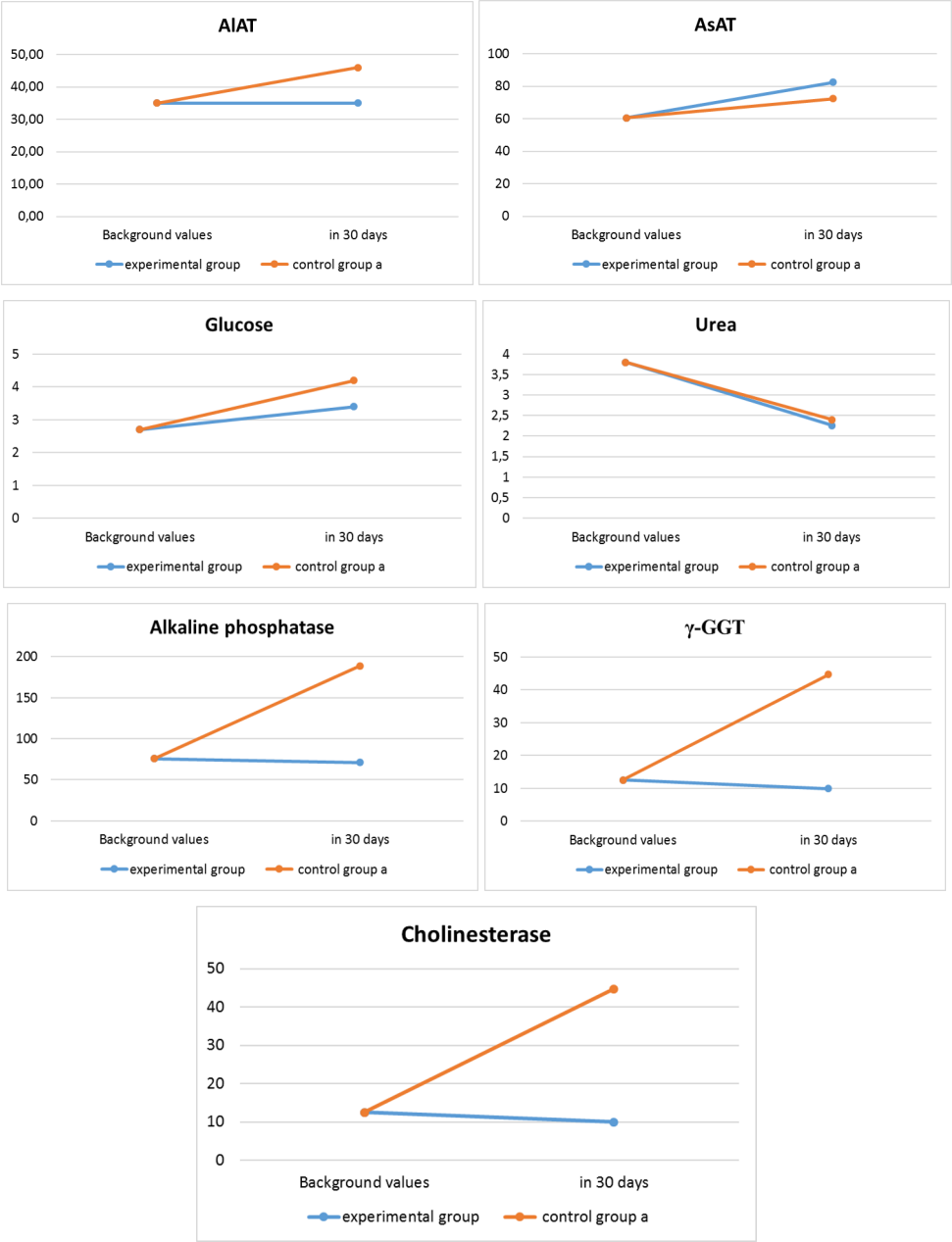


Fig. 2. Biochemical status of deep-bed cows of the Uralets Agricultural Farm

When assessing the function of the organs of the reproductive system, it was noted that the birth process proceeded physiologically and the number of afterbirth detentions was lower and did not exceed 3% of the number of calves. The number of postpartum endometriosis also decreased by 20% compared to the animals of the control group. When analyzing the number of postpartum pathology, it was noted that the number of ovarian hypofunction decreased by almost 2 times, and the number of other pathologies decreased to 2%. The service period for cows from the experimental group was 61.3 days, and in the control group – 70.8 days. The reproduction efficiency is shown in Table 4.

When evaluating the effectiveness of insemination, it was noted that the number of inseminations in the experimental group was 1.3, and in the control group – 1.8 times. In total, 13 cows were inseminated in the control group, and 18 sperm doses were spent on insemination of cows in the control group. The savings amounted to 5 sperm doses.

Table 4. Reproduction efficiency

Group, number of animals	Service period, days	Number of inseminations, average for the group	The cost of spermodose, rubles	Number of spermodoses per group, pieces
Experienced, n=10	61.25	1.3	1755	13
Control, n=10	70.83	1.8	2430	18

From the data in table 4, it can be seen that in the experimental group, the indicators reflect the positive use of the mineral adaptogen: the service period is shorter by 9.58 days, spermodose savings are 5 units, and the cost of spermodose costs is 675 rubles less than in the control group.

When conducting studies on feeding mineral adaptogen to pregnant cows 30 days before calving, it was shown that the cows had normalized hematological parameters, and changes in the biochemical status of cows were noted. In addition, it was noted that the birth process proceeded physiologically and the number of detentions of the afterbirth decreased.

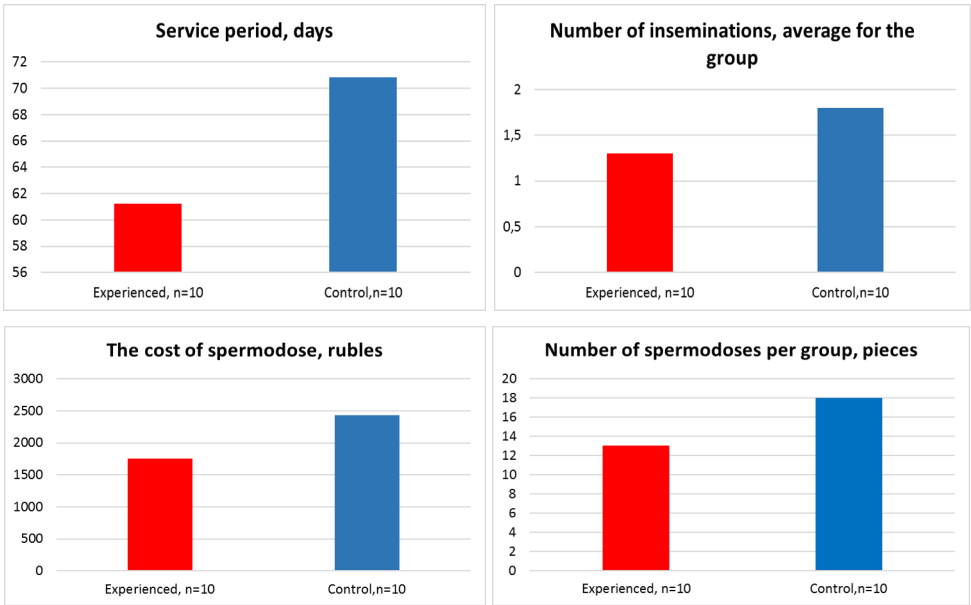


Fig. 3. The efficiency of reproduction in the Uralets Agricultural enterprise against the background of the use of a feed mineral additive - a mineral adaptogen.

Against the background of taking a mineral adaptogen, the cows of the experimental group showed an increase in milk productivity after calving (Table 5).

Table 5. Average daily milk yield of cows at the Uralets Farm

An experienced group	Milk yield, kg milk	The control group	Milk yield, kg milk
Average daily milk yield per 1 cow	25.3	Average daily milk yield per 1 cow	19.3

The cows of the experimental group have higher milk productivity after calving than those of the control group. The obtained data make it possible to judge that the mineral adaptogen has a positive effect on the dairy productivity of cows in the experimental group.

A month after the start of lactation, mastitis was registered 2 times more often in cows of the control group. The duration of treatment was the same.

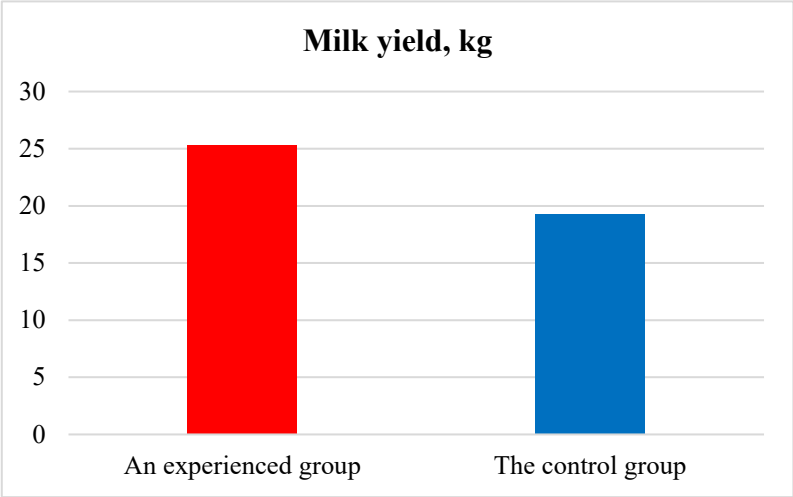


Fig. 4. Milk yield of cows of 2 lactation in the Uralets Agricultural farm against the background of the use of a mineral adaptogen

Cows are constantly exposed to technological stress, including therapeutic and preventive measures. According to the results of the use of mineral adaptogen in pregnant cows 30 days before calving, it shows the effectiveness of the effect on the body as a whole and on the organs of the reproductive system and the mammary gland, accompanied by an increase in milk yield (Fig.3).

5 Conclusions

- After analyzing the data obtained, the following conclusions can be drawn:
1. The introduction of mineral adaptogen into the diet of pregnant cows 30 days before calving has a positive effect on the birth process in cows and the birth of clinically healthy calves.
 2. The use of mineral adaptogen in cows reduces the amount of birth and postpartum obstetric and gynecological pathology, while postpartum endometritis is easier and the duration of their treatment is shortened.
 3. The service period is reduced to 61.25 days, which is 9.6 days less than in the control.

4. The increase in economic efficiency is associated with a decrease in infertility days and a reduction in the cost of artificial insemination, due to a decrease in the number of spermadoses, as well as a decrease in the incidence of mastitis and an increase in the average daily milk yield by 6 kg of milk compared with the control group.

5. In the cows of the experimental group, a synchronous decrease in diseases of the udder and organs of the reproductive system was revealed when feeding a mineral adaptogen.

Conflict of interest

The authors of the article confirm that the data provided by them does not contain a conflict of interest.

References

1. A. I. Afanasyeva, V. A. Sarychev, *Veterinary pathology*, **1**, 99 (2016).
2. O. A. Bykova, *Proceedings of the Orenburg State Agrarian University*, **3 (53)**, 186-187 (2015).
3. V. I. Volgin, A. Bibikova, L. Romanenko, *Animal Husbandry of Russia*, **3**, 27-28 (2005).
4. B.I. Protasov, I.I. Komissarov, *Agricultural Biology*, **6** (2012).
5. P.F. Soldatenkov, *The effect of sapropel on physiological processes in the animal body* (Nauka Publishing House, Leningrad Branch, L., 1976) 171.
6. N. N. Sudheimer, O. A. Bykova, *Zootechnia*, **2**, 10 (2013).
7. Merck Manual, *Veterinary Manual* www.merckveterinarymanual.com/poultry/mycoplasmosis/mycoplasma-gallisepticum-infection-in-poultry?query=airsacculitis
8. Dhama K. Chakraborty, S. Mani, R. Tiwari, A. Kumar, P. Selvaraj and R.B. Rai, *Int. J. Curr. Res.*, 1909-1919 (2013).
9. MerckManual/Veterinary, Manual/ www.merckveterinarymanual.com/poultry/mycoplasmosis/mycoplasma-gallisepticum-infection-in-poultry?query=airsacculitis