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REPRODUCTIVE PERFORMANCE OF BELARUSIAN COWS *(BLACK MOTLEY)* WITH EMPHASIS ON THE INFLUENCE OF SOME DRUGS ON ENDOMETRITIS

Elena HUMINSKAYA, Tatsiana LUPALAVA, Khairi El BATTAWY, Vitalii PETCU, Mikalai LOBAN

Abstract. The current study was carried out to investigate the impact of season of birth, age of the cows, time of first insemination, intervals between inseminations and diseases on fertilization, conception, pregnancy and days open in Belarusian cows. Moreover, «Hysterosan-MK» and «Fertilifil-K» were used for treatment of cows with endometritis. There was insignificant difference in our studies between the reproductive parameters and the season of the year, as well as age of cows. Only 15.7% of the cows were inseminated in the optimal period – 55-74 days, with a standard service period. In 48.3% of cows, the first insemination was carried out too late, and it was after 94.3±5.2 days. The service period of these cows exceeded the standard norm by 56 days. It was characterized by highest number of inseminations (2.7±0.05 times) accompanied with the lowest fertilization rate (7.1%). Cows inseminated for the first time in optimal terms had a fertilization rate of 65.2% and the number of artificial inseminations of 1.3±0.04 times. An extension in the period before the first insemination, followed by low fertilization rate was observed in those investigated cows. That extension may be referred to metabolic disorders and unbalanced ration. The results also declared that an improvement of the fertility of diseased cows was achieved after treatment with «Hysterosan-MK» and «Fertilifil-K» whereby it reached 43.1% and 95.4% respectively. In conclusion, it is economically expedient to carry out the first insemination in the period between 55-74 days. The total economic loss from barrenness for the analyzed animals amounted to 326. 743.7 US dollars or 450.6 US dollars per cow.

Keywords: Cows; Fertilization; Artificial insemination; Diseases; Barrenness; Sexual activity; Economic loss.

INTRODUCTION

The dairy-commodity complexes with free-range content require the existence of 700 dairy cows or more. Such huge number of animals is often vulnerable to many diseases, lack of reproductive efficiency, emergency slaughtering and death. Furthermore, those animals produce approximately 5000-6000 kg milk, which leads to an increase in the cost price of animal. The low fertilization is an indicator that indicates lack of needed work with the herd in all areas, starting from the content and feeding, and ending with proper timed artificial insemination and improvement of the genetic potential of animals. A clear and effective organization of breeding work is hampered by the lack of regular monitoring of the reproduction state of the breeding stock with the analysis of the necessary criteria for the fertility of cows.

Problems with successful insemination have always existed (Гавриченко, Н.И. et al. 2013). The main reason is low conception rate (39.1%) (Fentaye, K., et al. 2018). The most common pathological lesions in infertile cows are the mammary gland lesions (5.5-33.6%) (Гуминская, Е.Ю., et al. 2017; Fentaye, K., et al. 2018), mastitis, calving problems in 20.3 % of cases (Fentaye, K., et al. 2018) and limb diseases (9.3-55.2%) (Гуминская, Е.Ю., et al. 2017). Due to mastitis and lameness, up to 70-80% of animals are culled worldwide, and 20-30% of animals are eliminated after the first lactation (Гуминская, Е.Ю., et al. 2017). Long service period up to 120 days due to multiple unsuccessful inseminations leads to long inter calving period (more than 12 months) and reduces the period of economic use with about 2-3 years (Гуминская, Е.Ю., et al. 2017). This is associated with the main losses of milk production as it is known that milk yield in cows peaks around the sixth lactation, and they produce 25% more milk in comparison with previous lactations.

The reproductive disorders of Belarusian cows are often associated with the occurrence of gynecological diseases: functional disorders of the ovaries (ovarian hypofunction is observed in 25.9-34.6% of cows, persistent CL in cow ovaries -1.8-3.8%, ovarian cysts-3.7-7.7%), and uterine inertia 5,0-12,0%, detention of the afterbirth in 17.4-37.5% of cases; in the postpartum period: hypotension and uterine atony-8.0-11.0%, acute and chronic endometritis 3.3-27.6% of cows) (Гуминская, Е.Ю., et al. 2017).

The objective of the present investigation was to study the effect of birth season, age of the cows, time of first insemination, intervals between inseminations and diseases on fertilization, conception, pregnancy and days open in various cows. Moreover, the current study aimed to evaluate the effectiveness of the drugs «Hysterosan-MK» and «Fertilifil K» in treatment of endometritis.

MATERIALS AND METHODS

The data of 730 Belarusian black-motley breed cows were used in this investigation. Those cows were kept free in farms in the Mozyr District, Gomel Region, Republic of Belarus.

Various reproductive traits and parameters including: periods from calving to first and successful insemination (and for unfertilized animals from calving to last insemination or elimination), number of inseminations per pregnancy, the intervals between inseminations, fertilization after the first insemination were calculated. The selection of those parameters was determined taking into account the age of the animals, the calving season, and the state of animals' health.

The disease of the metritis complex or endometritis, was diagnosed by external examination of the genitalia (presence of purulent discharge) and rectal palpation, where the uterus is enlarged, lowered into the abdominal cavity, and it didn't contract well. The treatment of endometritis of various etiologies in the postpartum period was done using the drug «Hysterosan-MK». Repeatedly inseminated cows, with the syndrome of «multiple sexual activity», were inseminated with the drug «Fertilifil K».

Both drugs were developed by two groups of scientists at the Department of Biotechnology and Veterinary Medicine within the Educational institution «Belarusian State Agricultural Academy» in the composition of Medvedev G.F., Dolin N.I., Gavrichenko N.I., Belyavsky V.N. and Boreyko E.S. for the first drug, and Medvedev G.F., Gavrichenko N.I., Kukhtin O.N., and Huminskaya E.Yu., for the second drug respectively, and were produced by the production unitary «Mogilev Enterprise of Veterinary Medicines».

The drug «Hysterosan-MK» was dissolved in 50 ml of distilled water and administered intrauterine every 4-5 days. For a complete recovery were required 2-3 infusions (in complex cases, 4-5 infusions are needed).

Repeatedly inseminated cows (with the syndrome of repeat breeding syndrome) were inseminated with the drug «Fertilifil K». The drug was administered as a solution (mixture into 20 ml of distilled water), into the uterus of the cow before insemination, using a pipette. The animal was inseminated not earlier than 15 minutes after drug's administration. If it was necessary to repeat insemination during the cow's sexual activity, then the drug was used only before the first insemination.

Biochemical blood tests of cows were investigated in LU «Mozyr District Veterinary Station». Zootechnical analysis of feed was carried out in the Research Institute of Applied Veterinary Medicine and Biotechnology of UO «Vitebsk order «Badge of Honor «State Academy of Veterinary Medicine». Blood was analyzed from animals in different physiological states: milk cows of the main herd, dry cows, freshly calved heifers and heifers of breeding age. It was studied the content of carotene, calcium, phosphorus, reserve alkalinity, total protein, glucose. In the feed included in the ration were determined, the content of feed units, metabolic energy, digestible and crude protein, dry matter, crude fat, fiber, carotene, macro, and micronutrients.

The economic damage from barrenness was determined by the formula: (Митюков, А.С. et al, 1988).

$Lb = K \times Db \times P \times PP \times n$

where, Lb - is the sum of the losses from barrenness, USD.;

K - constant coefficient of 3.29;

Db - days of barrenness are determined by calculating 85 days from the actual duration of the service period;

P - productivity of cows, thousand kg of milk; n - number of cows;

PP - purchase price of 1 kg of milk of basic fat content of the region, USD.

The obtained data were processed using the «Statistics» program.

RESULTS AND DISCUSSIONS

In the analyzed farms, calvings are unevenly distributed by the seasons of the year. The peak of calvings occurs in the summer (30.1%) and autumn (26.7%) seasons. Such distribution of calving during the year cannot ensure high milk production rates (Table 1).

Fertilization after the first insemination in the autumn period was 61.6%. However, in the winter, spring and summer periods, this indicator was lower than the standard of 55% by 28%, 32%, and 30%, respectively. Low fertilization rate induced an increase in the number of inseminations in these periods and the lower is the fertilization rate (in the spring – 23%), the higher was the number of inseminations, 2.2±0.1 times.

Table 1. *Reproductive performance of cows depending on the calving season*

Reproductive parameters	Winter n = 165 (22.6%)	Spring n = 150 (20.5%)	Summer n = 220 (30.1%)	Autumn n= 195 (26.7%)
	$\bar{X} \pm m_x$	$\bar{X} \pm m_x$	$\bar{X} \pm m_x$	$\bar{X} \pm m_x$
Periods from calving (days) to 1st insemination	47.1±2.7	44.1±1.6	51.5±1.5	51.3±1.5
Fertilization	104.1±7.5	112.4±6.4	87.0±3.3	79.6±5.2
Number of inseminations	1.7±0.1	2.2±0.1	1.7±0.6	1.5±0.06
Conception rate, %	22.4	22.6	35.9	61.6
Number of eliminated cows, heads	27	23	25	15
Number of cows with diseases, heads.	38	50	41	24

Carrying out the first insemination without taking into account sexual cycles led to low fertilization rate and an increase in the number of inseminations, which in turn increased the service period. This indicator exceeded the standard (which is 85 days), 1.2 times in winter, and 1.3 times in spring. The service period was approaching in the summer to the standard indicator - 87.0±3.3 days, but in autumn, it was lower than the standard-79.6±5.2 days.

The percentage of sick animals after spring calving was 33.3%, after winter calving – 23.0%, after summer – 18.6%, and after autumn – 12.3%. These data indicate that in all seasons the incidence of sickness at cows was high.

Table 2. *Reproductive performance of cows depending on age*

Reproductive parameters	2 - 3 years n= 83	4 - 6 years n= 647
	$\bar{X} \pm m_x$	$\bar{X} \pm m_x$
Periods from calving (days) to 1st insemination	50.1 ± 2	49 ± 1
Fertilization	91.7±8.1	90.2± 2.7
Number of inseminations, times	1.8 ± 0.1	2 ± 0.04
Conception rate, %	59	37.4
Number of eliminated cows, heads.	0	91
Number of cows with diseases, heads.	11	113

In this study, most cows were 4-6 years old (88.6%) while animals of 7 years and older were absent (Table 2). Regardless of age, the first insemination was carried out 49-50 days after calving and the service period corresponded to physiological norms-90.2-91.7 days. However, at the same service period, in more adult animals, the number of inseminations for fertilization increased - 2±0,04 times. The fertilization in young animals was 59%, which is a satisfactory indicator. Fertilization decreases with age and in 4-6 years it is lower than the standard indicator of 55% by 17.6%. This is due to a higher incidence of diseases-17.4%. Young cows were not culled, but for cows with age, the cull was 14.1%.

The reproductive performance of cows is largely determined by the time of the first insemination after calving. Fertilization and service period depend on it (Table 3).

Table 3. *Reproductive performance of cows depending on the time of the first insemination*

Reproductive parameters	up to 54 days n=262 (35%)	between 55 - 74 days n=115 (15.7%)	over 75 days n=353 (48.3%)
	$\bar{X} \pm m_x$	$\bar{X} \pm m_x$	$\bar{X} \pm m_x$
Periods from calving (days) to 1st insemination	41.5±0.4	62±0.4	94.3±5.2
Periods from calving (days) to fertilization	32.4±1.2	63.8±0.5	141±3.4
Number of inseminations, times	0.8±0.02	1.3±0.04	2.7±0.05
Conception rate, %	73.3	65.2	7.1
Number of eliminated cows, heads.	66 (25.1%)	5 (4.3%)	20 (5.6%)
Number of cows with diseases, heads.	71 (27%)	8 (6.9%)	76 (21.5%)

Due to the intensive use of animals and unbalanced feeding in the first months after calving, insemination of animals in the first and even in the second sexual activity is rarely effective. This is due to the lack of energy for the development of follicles and good oocytes quality. The first insemination in most cows of 48.3% in the analyzed group was carried out too late, meaning after 94.3±5.2 days. The interval before the first insemination didn't exceed 45 days in 35% of animals, and only 15.7% of animals were inseminated in the optimal period - 55-74 days.

Respectively, in animals inseminated in the period up to 45 days and in the period between 55-74 days, the service period didn't exceed the standard of 85 days, and in animals inseminated for the first time in the period of 75 days or more, the service period exceeded the standard indicator by 56 days. Fertilization rates and the number of inseminations also depended on the time of the first insemination. Thus, the highest fertilization rate of 73.3% and the lowest number of inseminations was typical for animals inseminated for the first time in the period up to 45 days, and the lowest fertilization rate of 7.1% and the highest number of inseminations of 2.7±0.05 times, corresponded to the late first insemination of 75 days or more. Cows inseminated for the first time in optimal terms had a fertilization rate of 65.2% and the number of inseminations of 1.3±0.04 times. The largest number of dropped out, and cows with diseases of 25.1% and 27%, respectively, are typical for the group of animals inseminated in early terms. The lowest number of eliminated animals, as well as with diseases, is typical for the group of animals inseminated for the first time in the optimal time with 4.3% and 6.9%, respectively.

Based on the above and taking into account the high incidence of diseases, the need for full recovery and the economic side, it is recommended to carry out the first insemination in the period of 55-74 days (Salisbury & Van Demark 1966).

Table 4. *Distribution of the service period by duration depending on the time of the first insemination*

Service period in cows	Period from calving to first insemination					
	up to 54 days		between 55-74 days		over 75 days	
	n	%	n	%	n	%
up to 85 days	312	70.9	104	46.4	16	24.2
between 86 - 120 days	48	10.9	36	16.1	21	31.8
over 121 days	80	18.1	84	37.5	29	43.9
Итого	440	100	224	100	66	100

At the 1st insemination in the period up to 54 days in 70.9% of animals the service period was 85 days or less, and in 18.1% of animals it was 121 days or more. In 46.4% of animals inseminated in optimal terms between 55-74 days the service period was 85 days or less. When the 1st insemination was delayed to 75 days or more, 31.8% of animals had a service period of 86-120 days, and 43.9% of animals had a service period of 121 days or more (Table 4). Consequently, the delay of the first insemination after calving for various reasons leads to an increase in the duration of the service period. The long duration of the service period can also be associated with long intervals between infertility and re-insemination. In the analyzed farms, the duration of such intervals is too long (Table 5).

Table 5. *Frequency of intervals of different lengths between inseminations*

Intervals between insemination, days	Standard interval frequency, %	Actual frequency of intervals for the entire observation period, %	Winter	Spring	Summer	Autumn
2 - 17	up to 13	17.1	1.7	-	1.7	1.7
18 - 24	> 53	25	42	23.8	19	14.3
25 - 35	up to 15	25	31.1	14.9	25.7	28.4
36 - 48	up to 10	25	40.2	14	31	15
over 49	up to 10	24.8	27.2	16.2	24.3	31

Table 5 showed that 17.1% of cows were inseminated in the interval from 2-17 days after calving, at an established rate of 13%, which is associated with the use of hormonal drugs (prostaglandins) in the treatment of healthy animals. Normal intervals between inseminations from 18-24 days are only 25%, at a rate of 53% or more. Em-

bryonic mortality in the herd was 25% with the interval between inseminations of 25-35 days. This may be due to disturbance of the hormonal status of animals as a result of metabolic disorders, i.e. with insufficient energy for the full functioning of the ovaries (CL). Double intervals of 36-48 days are 2 times more than the established norm of 25% against 10%. This indicates errors in the detection of sexual activity or its skips.

On analyzing the distribution of intervals between inseminations depending on the season of the first insemination, it was found that the lowest percentage (14.3%) of normal intervals was in autumn. The percentage of doubled intervals is significantly higher in winter and summer with 40.2% and 31% respectively. It can be, in our opinion, due to misses of current sexual activity, and disturbance of sexual cyclicality because of unbalanced feeding. The frequency of intervals of 49 days or more in all seasons of the year was high and exceeded 2-3 times the standard figure.

Table 6 elaborates the frequency of different intervals between inseminations in animals depending on the presence or absence of obstetric and gynecological diseases.

Table 6. *Frequency of intervals of different length between inseminations taking into account diseases*

Intervals between insemination, days	Healthy cows		Sick cows	
	n	%	n	%
2 - 17	305	52.4	86	58.1
18 - 24	54	9.3	7	4.7
25 - 35	45	7.7	5	3.4
36 - 48	60	10.3	6	4.05
over 49	118	20.3	44	29.7
IN TOTAL	582	100	148	100

Respectively, in animals inseminated in the period up to 45 days and in the period between 55-74 days, the service period did not exceed the standard of 85 days, and in animals inseminated for the first time in the period of 75 days or more, the service period exceeded the standard indicator by 56 days. The fertilization rates and the number of inseminations also depended on the time of the first insemination. Thus, the highest fertilization rate of 73.3% and the lowest number of inseminations was typical for animals inseminated for the first time in the period up to 45 days, and the lowest fertilization rate of 7.1% and the highest number of inseminations of 2.7±0.05 times, corresponded to the late first insemination of 75 days or more. Cows inseminated for the first time in optimal terms had a fertilization rate of 65.2% and the number of inseminations of 1.3±0.04 times. The largest number of dropped out, and cows with diseases of 25.1% and 27%, respectively, are typical for the group of animals inseminated in early terms. The lowest number of eliminated animals, as well as with diseases, is typical for the group of animals inseminated for the first time in the optimal time with 4.3% and 6.9%, respectively.

Analyzing the frequency of different intervals between insemination in healthy and sick animals, we can see that all of them have a very low frequency of normal intervals of 9.3% and 4.7%, respectively. The intervals mainly with the duration of 2-17 days prevailed, and most of them (58.1%) were sick animals. We associate this with the treatment scheme, in which a prerequisite is the introduction of prostaglandins, after which the animals come in estrus and are fertilized despite of any diseases. In healthy animals, a large number of small intervals are associated as well with the use of prostaglandins, but due to the fact that cows didn't come in estrus. Also, a large number of intervals of 49 or more days have 20.3% in healthy animals, and 29.7% in sick cows. The cause of that may be due to previous diseases whether nutritional or infectious and lack of sexual activity.

Most of the cows in the analyzed group didn't have obstetric and gynecological diseases. Their period before the first insemination was of 51.7±0.7 days, and before fruitful insemination composed 88.8±2.2 days. The number of inseminations did not exceed the standard indicator 2 and amounted to 1.8±0.04, and fertilization was 48.1% (Table 7).

In animals with diseases, the number of inseminations for fertilization increased and amounted to 3.2±0.2 times. The service period increased to 181.9±10.9 days. In our opinion, this is due to a violation in the detection of cows in the sexual activity, as well as the lack of obvious signs of animals sexual activity (silent sexual activity), and metabolic disorders due to the lack of a balanced feed. The increase in the period before the first insemination, and therefore, low fertilization of 14% in sick animals, is also possibly associated with metabolic disorders.

Table 7. *Reproductive performance of healthy and sick animals*

Reproductive parameters	Healthy n = 582	With diseases n =57
	$\bar{X} \pm m_x$	$\bar{X} \pm m_x$
Periods from calving (days) to 1st insemination	51.7±0.7	56.5±2.8
fertilization	88.8±2.2	181.9±10.9
Number of inseminations, times	1.8±0.04	3.2±0.2
Conception rate, %	48.1	14

The organization of normalized, balanced, full and rational feeding is the main factor determining the health and productivity of animals, feed payment and profitability of animal husbandry. Per day, cows are fed, in the form of single feed, 3.0 kg of hay (8.0%), 1.3 kg of rapeseed cake (3.4%), 25 kg of silage (67.0%) and 0.25 kg of mixed fodder per liter of milk (13.4%). The chemical composition of feed is given in table 8.

Table 8. *Chemical composition of feed*

Determined analysis	Corn, silage	Crushed corn	Rapeseed cake	Concentrate feed	Hay
Feed Unit	0.16	0.69	1.01	1.1	0.48
Exchange energy in MJ	1.73	6.4	12.89	11.1	7.09
dry substance in g	0.172	0.685	0.93	0.886	0.854
crude protein in g	18.41	90.81	309.4	156	122.26
crude fat in g	6.47	29.6	150.15	75.7	18.76
crude fiber in g	38.21	19.29	111.93	36.7	296.79
crude ash in g	5.99	13.5	-	-	55.72
carotene in mg	14	0	-	-	19
calcium in g	0.91	2.3	6.1	6.2	5.88
phosphorus in g	0.54	0.67	10.4	9.6	2.8
mangan in mg	5.56	3.69	-	61.1	48.71
cobalt in mg	0.005	0.01	-	1.2	0.141
cupru in mg	0.603	0.395	-	9.4	5.907
zinc in mg	3.45	10.83	-	68.1	29.71

The following feed samples were selected for the chemical study: hay of mixed grass, rapeseed cake, corn silage, concentrate feed. We obtained the following results according to a comprehensive assessment of the samples of corn silage, which is correlated to the non-class quality, and mixed hay received the second class of quality. The daily ration of feeding was made on the basis of the feed chemical composition (Table 9).

The ration was not balanced for the dairy herd in the farms in most nutrients. Excess of crude protein was 3.5%, of crude fat was 85% and phosphorus was18.6%. The admissible deviations were +5% for EFU and +10% for other indicators. Also, it was found the insufficient content of fiber, which leads to disruption of scar digestion in the animal. The calcium-phosphorus ratio was 1.0, whereas at normal it is 1.44. This means that on 1 g of phosphorus in this ration can be optimally absorbed 1.44 g of calcium. It turns out that 0.44 g of calcium per 1 g of phosphorus in this case, may not be absorbed. To bring the calcium-phosphorus ratio to the optimal level in this ration, it is necessary to exclude partially feeds rich in calcium or introduce phosphorus supplements. This ration will not provide the planned productivity and can be used only after the elimination of all shortcomings. The concentration of Energy Feed Units in 1 kg of dry matter corresponds to 96.9% satisfaction. Satisfaction with Energy Feed Units in milk yield is 10.8%.

A biochemical study of animal blood was carried out in order to determine the degree of metabolic disorders, (Table 10).

The content of carotene and total glucose in blood of cows were below normal. Carotene is vital for normal growth and reproduction, as well as to increase the body's resistance to pathogens of various diseases. It enters the body of herbivores exclusively with plant feeds, since the animal body cannot synthesize it independently. It has antioxidant properties, provides cellular protection; affects the viability and fertilization of the ovule. Carotene affects the readiness of the endometrial mucosa for embryo implantation, reducing embryonic mortality; it is necessary for the growth and development of the fetus during the intrauterine period and during the neonatal period (Дмитриева, Т.О. 2012).

Table 9. *Daily ration of cows feeding*

Determined analysis	norm	Corn, silage, kg	Crushed corn, kg	Rape-seed cake, kg	Concent rate feed, kg	Hay, kg	Total	± to norm	% satisfa ctions
		25	3	1.3	5	3	37.3		
Energy Feed Unit	16,8	4	2.1	1.3	5.5	1.4	14.3	-2.4	85.2
Exchange energy in MJ	168	43.2	19.2	16.7	55.5	21.2	155.9	-12.0	92.8
dry substance in kg	15,7	4.3	2.1	1.2	4.4	2.6	14.6	-1.1	93.1
crude protein in g	2200	460.2	272.4	402.2	780	366.7	2281.6	81.6	103.7
crude fiber in g	3790	955.2	57.8	145.5	183.5	890.3	2232.5	1557.5	58.9
crude fat in g	475	161.7	88.8	195.2	378.5	56.3	880.5	405.5	185.3
calcium in g	100	22.7	6.9	7.9	31	17.6	86.2	-13.7	86.2
phosforus in g	72	13.5	2.0	13.5	48	8.4	85.4	13.4	118.6
caroten in mg	640	350	0	0	0	57	407	-233	63.5
mangan in mg	850	139	11.01	0	305.5	146.1	601.7	-248.3	70.7
cobalt in mg	10	0.1	0.0	0	6	0.4	6.5	-3.4	65.7
cupru in mg	131	15.1	1.2	0	47	17.7	80.9	-50.0	61.8
zinc in mg	850	86.2	32.5	0	340.5	89.1	548.3	-301.6	64.5
Concentration of EFU in 1 kg of dry subst ance 1.01							0.9	-0.03	96.9
Content of EFU in the yield of milk	6.6						0.7	-5.8	10.8

The concentration of calcium and phosphorus in the blood were at the lower limit of normal. It is established that the concentration of Ca in milk does not decrease even with severe deficiency. In the subclinical form of Ca deficiency during calving is observed weak muscle contraction, which slows down the calving process, involution of the uterus and leads to metritis in cows. Ovulation is delayed in such animals and fertilization decreases.

Table 10. *Indicators of blood biochemical analysis of cows*

Biochemical parameters	Test blood	Norm
Carotene, mmol / l	0.007±0.00006	0.009-0.02
Calcium, mmol / l	2.64±0.06	2.5-3.1
Phosphorus, mmol / l	1.48±0.03	0.3-1.9
R.A., CO2 volume percentage	51.04±0.53	50-60
total protein, g / l	76.5±1.1	72-90
Glucose, mmol / l	1.6±0.08	2.22-4.4

Phosphorus improves the metabolic functions of the rumen, namely, increases the degree of the fiber splitting and the use of nitrogenous substances by rumen microbes. The Ca/P ratio should be during lactation1.5-2:1. In the ration of analyzed cows, it is 1:1.

The reserve alkalinity is a value expressing the amount of carbon dioxide contained in the blood in the form of bicarbonates. The decrease of reserve alkalinity in the blood of animals 51,04±0,53 about % CO_2 testifies the shift of acid-alkaline balance towards acidosis.

The blood glucose content of cows was very low 1.6±0.08 mmol / l, indicating a deficiency of glycogenic starch in the used feed. With an insufficient supply of cells with glucose are forming ketone bodies, and their increase is a means of limiting the mobilization of fat that prevents deep metabolic disorders.

The total protein content is 76.5±1.1 g / l. It is impossible to estimate the level of protein nutrition of cows by the concentration of total protein in the blood, because this indicator depends on many factors (Горюнова, Т.Ж. et al, 2017).

The obtained results of biochemical blood analysis confirmed unbalance ration and indicated reproductive disturbance of cows: presence of endometritis, embryonic mortality, the presence of many numbers of cow's sexual activity, and the lack of fertilization.

In the treatment of clinical endometritis, before the introduction of the drug «Hysterosan-MK», was removed inflammatory exudate by careful massage of the uterus through the rectum. After the release of the uterus from the exudate, one dose of the prepared solution of the drug (50 ml) was inserted into the body of the uterus so that the solution was distributed in both horns.

While preserving signs of inflammation, the administration of the drug was repeated every 48-72 hours, depending on the severity of the disease until complete recovery. Side effects, complications, and allergic reactions were not observed when using the drug. Milk from cows that used the drug was used a day after administration.

A total of 51 cows were treated. The drug was dissolved in 50 ml of distilled water and administered intrauterine every 4-5 days. For full recovery were needed 2-3 introduction but in complex cases were needed 4-5 introduction of it. As a result, the period before the first insemination was reduced, which was 54.7 days, the service period was 92.2±8.4 days, and fertilization after the first insemination was 43.1% (Table 11). After treatment of cows with the drug «Hysterosan-MK» decreased the number of inseminations to 1.8±0.1 times.

Table 11. *Reproductive parameters at cows in the treatment with the drug «Hysterosan-MK»*

Reproductive parameters	«Hysterosan-MK»
Number of cows	51
Culled cows	0
Service period, days	92.2±8.4
Periods from calving to 1st insemination, on average days	54.7±3.5
Number of inseminations, times	1.8±0.1
Fertilization rates ,%	43.1

Many times inseminated cows with the syndrome of repeated sexual activity, were inseminated with medicine «Fertilifil-K». When sexual activity was repeated after a second or more infertile insemination and were detected signs indicating subclinical endometritis, the drug was dissolved in water for injection heated to 40- 45°C, at the rate of 20 ml per 1 dose of the drug, and with the help of a pipette was introduced into the uterus of a cow before insemination. The animal was inseminated not earlier than 15-60 minutes after administration of the drug. The solution was introduced into the uterus before the first insemination during sexual activity. The insemination with the solution «Fertilifil-K» started after two or three previous fruitless insemination. Fertilization after the third insemination became 95.4% (Table 12).

Table 12. *Reproductive parameters of the herd during the insemination with the solution «Fertilifil-K»*

Reproductive parameters	«Fertilifil-K»
Number of cows	66
Culled cows	0
Service period, days	164.3±7.4
Periods from calving to 1st insemination, on average days	49.9±1.5
Number of inseminations, times	3.4±0.1
Fertilization rates ,%	95.4 %

In total, 66 cows were inseminated with «Fertilifil-K», and the average number of inseminations was 3.4 times. The fertilization became 95.4% after several therapeutic measures and insemination with the solution «Fertilifil-K».

Infertility losses are enormous (Митюков, A.C. et al, 1988), direct losses from infertility can be attributed to: the death of calves, reduced milk production, culling of milk in the process of treatment of cows, the cost of treatment (the cost of drugs, payment of a specialist), and the cost of animals care while indirect losses include: an increase in the number of inseminations, an increase in the number of diseases, culling of adult cows, a decrease in reproductive capacity.

Culling of cows due to infertility is inferior in scale only to culling due to low milk productivity. Among heifers culled at the age of 16-24 months, only 2/3 of those animals show low reproductive performance.

The calculation of the damage from barrenness on animals calving in different periods of the year, with different diseases and depending on the time of the first insemination, is presented below. The economic damage for cows with a service period of more than 85 days amounted to: calving in winter (165 cows) - 30254, 5 US dollars (per animal-183 US dollars.); calving in spring (150 cows) - 53856, 2 US dollars (per animal-359 US dollars). The total amount of damage from barrenness for all animals included in the analysis constituted 84110, 4 US dollars.

In the analyzed group there were 57 animals with various diseases; the service period, which averaged 181.9 days. Economic damage from barrenness amounted to-52859, 7 US dollars or 927,3 US dollars per 1 head.

Economic damage from the barrenness depending on the timing of the first insemination constituted for 353 cows which were inseminated in the period of 75 days and above -189773,6 US dollars (per animal damage is an average of 537,6 US dollars).

Thus, the main economic damage in the economy is attributed to too late (75 days or more days) insemination after calving and high incidence of obstetric and gynecological diseases.

CONCLUSIONS

There was insignificant difference in our studies among the parameters of cow's reproductive performance and the season of the year, as well as age. Only 15.7% of the cows were inseminated in the optimal period-55-74 days, with a standard service period. In 48.3% of cows, the first insemination was carried out too late, and it was after 94.3±5.2 days. The service period of these cows exceeded the standard norm by 56 days. They were characterized by highest number of inseminations (2.7±0.05 times) accompanied with the lowest fertilization rate (7.1%). The cows inseminated for the first time in optimal terms had a fertilization rate of 65.2% and the number of inseminations of 1.3±0.04 times.

Our studies showed that normal intervals among inseminations were only 25%. Herd embryonic mortality was about 25%. Double intervals between inseminations are 25%. In healthy cows (animals without obstetric and gynecological diseases), the fertility % was 48.1 in comparison with 14% in those diseased ones. Most of the animals with about 79.7% did not have obstetric and gynecological diseases. For them, the period before the first insemination was 51.7±0.7 days, and before fruitful insemination, it became 88.8±2.2 days. The number of inseminations did not exceed the standard indicator of two and amounted to 1.8±0.04 times, and with the fertilization of 48.1%. In animals with diseases, the number of inseminations for fertilization increased and amounted to 3.2±0.2 times, and the service period increased to 181.9± 10.9 days, with the fertilization of 14%.

An extension in the period before the first insemination, followed by low fertilization rate was observed in those investigated cows. That extension may be referred to metabolic disorders and unbalanced ration.

Treatment of endometritis of various etiologies was conducted by the drug «Hysterosan-MK». As a result of its use, the period before the first insemination decreased by 2 days (amounted to 54.7 days), and the number of inseminations decreased 1.4 times. The service period became 92.2±8.4 days, so it decreased 2 times. Fertilization after the first insemination became 43.1% and it increased 3 times.

After a number of therapeutic measures and insemination with the drug «Fertilifil K» fertilization was 95.4%, and the average number of inseminations constituted 3.4 times.

The total amount of damage from the cow barrenness on the analyzed animals was 326743.7 US dollars. The loss constituted 450.6 US dollars per cow. It is established that each cow with diseases and even after qualified treatment brings damage of 927, 3 US dollars. Late insemination, after 75 days or more, brings 58.1 % damage.

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INFORMATION ABOUT AUTHORS

HUMINSKAYA Elena https://orcid.org/0000-0001-6522-6228
Doctor of Agricultural Sciences, associate professor, Research coordinator of the group on breeding and selection of beef cattle, Republican Unitary Enterprise «The Scientific and Practical Center of the National Academy of Sciences of Belarus on animal husbandry», Republic of Belarus
E-mail: elena.huminskaya@yandex.ru

LUPALAVA Tatsiana https://orcid.org/0000-0003-4604-9267
Doctor of Agricultural Sciences, associate professor, Department of Biology and Ecology, Faculty of Technology and Biology, Mozyr State Pedagogical University named after I.P. Shamyakin, Republic of Belarus
E-mail: LupolovT@tut.by

Khairi El BATTAWY https://orcid.org/0000-0002-9448-0599
PhD in Animal Reproduction and Artificial insemination, associate professor, National Research Centre, Animal Reproduction and Artificial Insemination Dept., Cairo, Egypt
E-mail: ekhairi@hotmail.com

PETCU Vitalii * https://orcid.org/0000-0003-2405-3548
Master of Agricultural Sciences, scientific secretary, Public Institution "The Scientific and Practical Institute of Biotechnologies in Zootechny and Veterinary Medicine", Maximovca, Republic *of* Moldova

Mikalai LOBAN
Doctor of Agricultural Sciences, associate researcher, Head of the Pig Breeding Laboratory, Republican Unitary Enterprise «The Scientific and Practical Center of the National Academy of Sciences of Belarus on animal husbandry», Republic of Belarus

*Corresponding author: petcuvitalii@yahoo.com

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