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Research paper

Economic and Biological Features of the Holstein Cows Selected in Hungary when Year-Round Stable System

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Abstract

The purpose of the work is to study economic and biological features of the Holstein cows selected in Hungary when year-round stable system in conditions of the reconstructed dairy complex. Economic characters of purebred Holstein cows of Hungarian selection were studied (86 animals). The diets of cows were formed using the ASP program. Feeding control was carried out on the biochemical parameters of cows' blood. Hematological parameters of blood: leukocytes, erythrocytes and hemoglobin were determined with hematology analyzer XT-2000i from Sysmex. Total protein in blood serum (by biuret reaction), albumins and globulins, and bilirubin were determined with photocolorimeter KFK-2. The content of glucose and cholesterol in the blood was determined with the help of a biochemical automatic analyzer. Blood enzymes: ALT and AST were determined by the Reitman-Fraenkel method. Lactation yield and milk quality of cows were studied by the first three lactations, depending on the genealogical affiliation on three lines: Montvik Chiftain - 17 heads; Vis Beck Idiala - 50 heads and Reflection of Sovering - 19 heads. To study the lactation performance of cows, information recorded in computer base "SELEX", functioning at the farm, was used. The intensity of milk ejection was considered with the help of "Dairymaster" program. The physical-chemical parameters of Holstein cows' milk were studied in the second lactation. The following parameters were determined in milk: density, acidity, freezing point, heat resistance, purity, fat weight fraction, protein, lactose and SOMO. Milk quality parameters were determined with the help of ultrasonic device "Ecomilk-M". In addition to the above parameters, the presence of antibiotics and the number of somatic cells were determined in the commercial milk. Holstein cows of the Hungarian selection had economic and biological features due to age and genealogical affiliation. The maximum milk yield for three full lactations was obtained from cows of the Vis Beck Idiala line - 20,881 kg of milk. In comfortable conditions of keeping and feeding, the Holstein cattle of the Hungarian selection realized the genetic potential: in terms of milk yield by 86.1-98.6 %, in the fat weight fraction by 102.7-108.4 % and in protein weight fraction by 95.2-104.9 %.

Keywords: *Holstein breed, cows, Hungarian selection, year-round stable system, lactation performance, milk quality.*

1. Introduction

In dairy cattle breeding of many countries of the world, the highly productive Holstein breed takes the leading position. Animals have high lactation performance, good adaptability to industrial conditions of housing and milking. Cows have high growth, large live weight, a well-developed bath-shaped udder, with the same development of dairy lobes and a high milk flow rate. Holstein cattle is the result of long-term breeding work and is in demand in many countries of the world [9, 11, 12].

Under conditions of loose housing and balanced feeding, the milk yield of Holstein cows in the pedigree herds of the Russian Federation reaches 8,000–10,000 kg, and the average milk yield of

Holstein cows in commodity farms is at the level of 6,000–7,000 [1, 5].
In recent years, many countries of the world have paid much attention the development and creation of a new model of selection and breeding work that optimally combines high lactation performance, reproductive qualities, productive longevity of cows and profitability. The breeding programs of the USA, Canada and Holland have new signs: fertility, lifetime profit index and profitability index [8, 13, 16,17, 18, 19, 21, 22, 24, 31].
The modern dairy livestock differs in its economic and biological parameters from the black-and-white type of European countries [25-28].
The cows of the American-Canadian type have distinctive features in the exterior and constitution. When adapting highly productive Holstein cattle, the biological characteristics of animals, housing conditions, feeding and microclimate should be taken into account. There are three adaptation factors: selection, stress resistance, anti-stress prevention and therapy [2, 3, 4, 23, 29, 30].
With the year-round loose housing of Holstein cows, such economic characters as lactation performance, disease resistance, strength of constitution, suitability for machine milking and productive longevity are of prime importance. An important factor in breeding Holstein cattle is the technology of housing, it should be as close as possible to the biological needs of animals. It is necessary to create conditions of increased comfort for keeping cows and provide animals with high-quality feeds in accordance with the physiological condition [12, 16, 17].
The aim of the investigation is to study the economic characters of the Holstein breed cows of the Hungarian selection with year-round housing.
The investigation tasks are as it follows:
- justifying the technology of the cows' year-round loose housing;
- studying the feed base and technology of cows' feeding to realize the genetic potential;
- analyzing the technology of milking and primary processing of milk in milking parlor “Dairymaster Milk Manager”;
- studying the economic characters of the Holstein cows of the Hungarian selection;
- studying the lactaion yield and milk quality of cows, depending on the genotypic and phenotypic factors;
- determining the economic efficiency of milk production of Holstein cows of the Hungarian selection with year-round stable system.

2. Materials and Methods

Experimental studies took place in the conditions of the dairy complex of the breeding reproducer of Ryazan oblast. Experimental animals were kept at the dairy complex with a straight-line sectional system of milk production. The conditions of housing and feeding the experimental cows were the same and met the existing requirements.
The economic characters of purebred Holstein cows of the Hungarian selection were studied (86 animals). The rations for feeding the cows were in the “Feed rations” program. Zootechnical analysis of fodder was performed in the feed laboratory of Lukhovitsky district in Moscow oblast.
Feeding control was carried out on the biochemical parameters of blood of cows. Blood was collected from the jugular vein before feeding (3 animals from each group). Such hematological parameters of blood as leukocytes, erythrocytes and hemoglobin were determined with the help of hematology analyzer XT-2000i from Sysmex. Total protein in the blood serum (by biuret reaction), albumins and globulins, as well as bilirubin were determined with the help of photocolorimeter KFK-2. The content of glucose and cholesterol in the blood was determined with Statfax 1904 and a biochemical automatic analyzer. Such blood enzymes as ALT and AST were determined by the Reitman-Fraenkel method.
Lactation yield and milk quality of cows were studied by the first three lactations taking into account the genealogical origin: Montvik Chiftain - 17 heads; Vis Beck Idiala - 50 heads and Reflection of Sovering - 19 heads. The lactation performance of cows was studied in the system “SELEX”, functioning at the farm, and the intensity of milk ejection was taken into account according to program “Dairymaster”.
The composition and physical-chemical properties of milk were studied by the following parameters: density, acidity, freezing point, heat resistance, mass fraction of fat, protein, lactose and SOMO. Milk quality parameters were determined using ultrasonic device "Ecomilk-M".
Experimental data were processed by the method of mathematical statistics for N.A. Plokhinskiy, 1969 and E.K. Merkuryeva, 1970 using the standard package of statistical analysis Microsoft Exsel-2007.

3. Results

Milk production at pedigree breeding unit JSC "AgroCapital" is carried out in the dairy complex, reconstructed for loose housing of cows throughout the year. The dairy complex is divided into production workshops: increasing the milk yield and insemination from 1 to 90 days; milk production from 91 to 305 days; dry cows (60 days); maternity barn (10 days); milking parlor; primary milk processing; veterinary clinic in the maternity barn; information center for process control (selection, feeding, milking and primary processing of milk).
The reconstruction of the dairy complex for 400 cows allowed the introduction of a continuous-flow sectional milk production system, the establishment of production workshops and the modernization of milk production technology. High-tech equipment with the milking parlor of the Irish company "Dairymaster" has been introduced into production.
Selection and breeding work with the herd is carried out in the information program "Plinor". The farm breeds purebred Holstein cattle, imported from Hungary and the Netherlands. The main method of cattle breeding is purebred: along lines and families. The method of genetic markers is used in breeding work. The animals mainly belong to three genealogical lines: Vis Beck Idiala, Montvik Chiftain and Reflection Sovering. The improvement of the breeding and productive qualities of the breeding stock is carried out by individual fixing the bulls-improvers, assessed by a complex of characteristics and the quality of the offspring. The semen of bulls is imported from the Federal State Unitary Enterprise “Central Station for Artificial Insemination of Farm Animals” (FSUE CSAI), JSC “Moscowskoe” for breeding work and from abroad.
The lactation performance of the best Holstein cows selected for the mothers of bulls is at the level of 9-10 thousand kg of milk and more. The fat content in milk is more than 4.0 % and the protein content is more than 3.2 %.
To prepare rations, cows of the dairy herd are divided into four technological groups. The first group consists of fresh calves with a yield of between 35 and 30 kg per day, the second group gives 30-25 kg, cows of the third group give 25-20 kg and those of the fourth group are down-calving ones. Particular attention was paid to the diets of cows for increasing the milk yield in the period from 10 to 90 days of lactation. In the winter period the diet included hay, vetch-oat silage, corn silage, mixed fodder K 60-1-89 for lactating cows (granulated), mixed fodder K 61 from 6000 (crumbled), sunflower cake, crystalline glucose, selplex, premix, rumimax, salt and fodder chalk. In the summer period, the main feed in the ration of cows was the herbage of milk-wax maize and green forage. The fodders were crushed to a length of 5-7 cm with the help of feed mixer IRSK 12 "Master" and distributed to feed tables twice a day.
Monitoring the full value of feeding was carried out on the biochemical parameters of the blood of cows increasing the milk

yield. According to the results of studies, the reserve alkalinity was 43.7-37.0 vol. % CO2 at the rate of 40 vol. % CO2, the total protein ranged from 7.9 % to 9.0 % at the rate of 7.0 %, calcium was at the level of 11.4 -10.2 mg % at the rate of 9.0 mg % and phosphorus was at the level of 6.4-5.9 mg % at the rate of 5.0 mg %.

The enzymatic activity of the blood of cows was within the physiological norm or exceeded it. The content of AST was 1.5 ± 0.11 mmol / l (+0.3) and that of ALT was 1.6 ± 0.2 (+0.5). Alkaline phosphatase was at the level of 1.7 ± 0.09 baud. The content of alpha-amylase was 56 ± 16.4 units at the rate of 8-32 units.

Consequently, in the period of maximum productivity in Holstein cows of the Hungarian selection, an increased content of enzymes was observed in the serum, which indicated the intensity of mineral, protein and carbohydrate metabolism.

Economic and biological features of Holstein cows of the Hungarian selection. The primary parameter of dairy cows' productivity is live weight. Live weight is the most important feature of cattle breeding, affecting the lactation performance of cows and characterizing their development.

However, analysis of the vast array of animals in the Nordic countries showed that the cows' weight does not have any positive effect on their productivity due to the fact that large animals consume more feed to maintain their own life activity [9].

The results of our investigations have shown that cows in the third lactation had the maximum live weight. The animals of the Reflection of Sovering line are 568.7 kg, which is 17.1 kg or 3.1% more as compared to the animals of the Vis Beck Idiala line and 3.4 kg or 0.6 % as compared to the Montvik Chiftain line (Table 1).

Table 1: Economic and biological features of cows, depending on the genealogical affiliation

Lactation	Age of 1st calving	Live weight, kg	Milk ejection intensity, kg / min	Service-period, days	Dry period, days	Lactation stability coefficient
Vis Beck Idiala line (n=50)						
First	25.4 ± 0.38	519.2 ± 3. 4	1.12 ± 0.2	152.4 ± 10.4	-	90.1 ± 1.6
Second	-	530.8 ± 2.3	0.93 ± 2.3	147.4 ± 14.2	52.7 ± 1.3	92.4 ± 2.3
Third		551.6 ± 9.0	1.71 ± 0.1	157.2 ± 16.4	58.5 ± 4.0	98.8 ± 1.9
On the average			1.25 ± 0.9	152.3 ± 14.0	55.6 ± 2.7	93.8 ± 1.9
Montvik Chiftain line (n=17)						
First	25.8 ± 0.56	523.8 ± 6.2	1.44 ± 0.3	207.4 ± 20.7	-	86.5 ± 1.9
Second	-	538.4 ± 3.9	1.44 ± 0.3	185.4 ± 24.3	56.02 ± 2.4	92.5 ± 2.6
Third	-	565.3 ± 12.0	1.76 ± 0.07	185.7 ± 21	63.7 ± 5.7	96.7 ± 3.0
On the average			1.55 ± 0.22	192.8 ± 22.0	59.9 ± 4.0	91.9 ± 2.5
Reflection of Sovering line (n=19)						
First	25.5 ± 0.70	516.1 ± 3.4	1.2 ± 0.3	184.6 ± 31.3	-	91.7 ± 2.6
Second	-	557.4 ± 8.9	1.2 ± 0.3	147.9 ± 23.1	55.8 ± 3.3	93.7 ± 2.1
Third	-	568.7 ± 8.9	1.63 ± 0.08	137.4 ± 13.8	60.8 ± 3.0	96.1 ± 1.0
On the average			1.34 ± 0.23	156.6 ± 23.0	58.3 ± 3.2	93.8 ± 1.9

Note: * - The results are reliable with P ≥0.95; ** - P ≥0.99; *** P ≥0.999. The duration of the interlactation period was within the physiological norm and was 52.7-63.7 days. The duration of the service period for Holstein cows of the Hungarian selection was relatively high and was within 152.3-181.5 days, the minimum duration was for animals of the Vis Beck Aidiala line - 152.3 days.

The intensity of milk ejection was at the level of 0.93-1.76 kg / min and increased from the first lactation to the third one by 0.32-0.59 kg / min or by 26.6-34.5 %. Over the course of three lactations, cows belonging to the Montvik Chiftain line had the best intensity of milk ejection equal to 1.55 ± 0.22 kg / min.

The exterior evaluation was carried out on basic measurements characterizing the growth and development of animals. The study of exterior measurements of the Holstein cows showed that they increased with age from the first lactation to the third one. Thus, the height at the withers of the cows in the first lactation was within 138.2-140.4 cm, an average of 138.7 ± 0.2 cm, and in the third lactation, this parameter increased by 5.7 cm or 4.1 % and was 144.4 ± 0.2 cm. Significant differences depending on genealogical affiliation were not found.

The daughters of the bulls of the Montvik Chiftain line had the maximum slanting length of the body in all three lactations - 173.2 ± 0.9-177.9 ± 1.3 cm.

The daughters of the bulls of the Reflection of Sovering line had the maximum girth of the breast behind the shoulders, 192.0 ± 1.0-193.3 ± 1.2 cm, in the second and third lactations.

Based on the studies, we found that the Holstein cows of the Hungarian selection had exterior characteristics due to the age and genealogical affiliation of the cows. Animals belonging to the Reflection of Sovering line had the best commercial-biological traits.

The lactation performance of the Hungarian cows increased from the first to the third lactation by 1156-1419 kg or by 19.7-25.4 %. The maximum increase in milk yield on average for three lactations was given by Reflection of Sovering cows - 1419 kg or more that was 25.4 % higher as compared to the milk yield from the first lactation (Table 2).

A comparative evaluation of the lactation performance of cows, depending on their genealogical affiliation, showed that the maximum lactation performance was obtained from cows of the Vis Beck Idiala line: for the third lactation - 7034 kg with fat content of 3.99 %, the average yield of three lactations - 6373.7 kg and the milk ratio was 1192.2 kg. The mass fraction of fat in the milk of cows of the Holstein breed of the Hungarian selection was at the level of 4.0 % and higher. The maximum parameter of fat in milk was 4.16 % on average for three lactations obtained from Montvik Chiftain cows and the yield of milk fat was 259.2 kg. Mass fraction of protein in milk on average across all the lines studied by us was within 3.11-3.21 %. The maximum protein content in milk was observed in daughters of bulls of the Reflection of Sovering line in the third lactation - 3.21 %.

Table 2: Молочная продуктивность коров по трем лактациям в зависимости от генеалогической принадлежности

Lactation	Milk yield for 305 days, kg	Mass fraction of fat, %	Milk fat, kg	Mass fraction of protein, %	Milk protein, kg	Live weight, kg	Milking capacity coefficient, kg
Vis Beck Idiala line (n=50)							
First	5878±95.4	4.07±0.03	238.6±3.1	3.11±0.2	181.4±3.3	519.2±3.4	1132.1
Second	6209±121	4.16±0.03	257.5±4.4	3.14±0.01	196.3±4.2	530.8±2.3	1169.3
Third	7034±122	3.99±0.04	280.2±9.3	3.17±0.02	215.5±6.4	551.6±9.0	1275.2
On the	6373.7±113	4.07±0.03	258.8±5.6	3.14±0.08	197.7±4.6	533.9±4.9	1192.2

average							
Montvik Chiftain line (n=17)							
First	5529±383	4.11±0.04	240.0±6.4	3.11±0.01	181.3±4.8	523.8±6.2	1055.6
Second	6096±159	4.21±0.04	256.7±7.3	3.15±0.01	191.7±4.7	538.4±3.9	1140.7
Third	6787±119	4.15±0.04	281.0±6.2	3.18±0.02	215.5±5.5	565.3±12.0	1200.6
On the average	6137.3±220	4.16±0.04	259.2±6.6	3.15±0.01	196.2±5.0	542.5±7.4	1132.3
Reflection of Sovering line (n=19)							
First	5584±194	4.10±0.04	240.4±7.6	3.12±0.08	183.1±6.1	516.1±3.4	1082.0
Second	6114±155	4.14±0.05	252.4±6.7	3.14±0.01	192.6±5.0	557.4±8.9	1096.9
Third	7003±265	4.04±0.07	283.0±12.7	3.21±0.02	224.8±8.2	568.7±8.9	1231.4
On the average	6233.7±205	4.09±0.05	258.6±9.0	3.16±0.04	200.2±6.4	547.4±7.1	1136.8

The results of studies on the lactation performance of cows for three full lactations showed that the largest amount of milk was got from Vis Beck Idiala cows - 20880.9 kg, which is 3152 kg or 17.8 % more as compared to the productivity of Montvik Chiftain cows and 1514.8 kg or 7.8 % more as compared with the productivity of Reflection of Sovering cows (Table 3).

Table 3: Lactation performance of cows for three full lactations

Vis Beck Idiala line (n=50)				
Milk yield, kg	Fat, %	Milk fat, kg	Protein, %	Milk protein, kg
20880.9±869.4	4.01±3.9	778.3±56.0	3.15±0.008	656.9±26.9
Montvik Chiftain line (n=17)				
17728.9±911.6	4.16±0.04	687.5±56.0	3.16±0.09	559.9±28.2
Reflection of Sovering line (n=19)				
19366.1±659.9	4.10±0.04	791.2±22.9	3.19±0.04	615.1±20.7

The maximum yield of milk fat was obtained from the Reflection of Sovering line - 791.2 kg and the maximum protein yield due to high productivity was obtained from Vis Beck Idiala cows - 656.9 kg.

In order to study the genetic potential of cows, depending on their origin, we conducted an analysis of lactation performance of mother cows, taking into account their genealogical affiliation (Table 4).

Table 4: Realization of the genetic potential of Hungarian selection cows by the third lactation

Parameter		Vis Beck Idiala	Montvik Chiftain	Reflection of Sovering
Parent cow index - PCI	Milk yield, kg	8169.4±353	7775.3±420	7104.1±374
	Fat, %	3.68±0.03	4.04±0.16	3.91±0.10
	Protein, %	3.02±0.05	3.34±0.06	3.24±0.07
	Milk fat, kg	300.7±13.1	321.6±23.8	275.0±12.3
	Milk protein, kg	241.3±12.9	260.4±15.3	228.0±9.5
Own productivity	Milk yield, kg	7034±122	6787±119	7003±265
	Fat, %	3.99±0.04	4.15±0.04	4.04±0.07
	Protein, %	3.17±0.02	3.18±0.02	3.21±0.02
	Milk fat, kg	280.2±9.3	281.0±6.2	283.0±12.7
	Milk protein, kg	215.5±6.4	215.5±5.5	224.8±8.2
Realization of genetic potential - RGP	Milk yield, kg	86.1	87.3	98.6
	Fat, %	108.4	102.7	103.3
	Protein, %	104.9	95.2	99.1
	Milk fat, kg	93.2	87.4	102.9
	Milk protein, kg	89.3	82.8	98.6

As a result of the investigations, it was established that the realization of the genetic potential for the third lactation in respect of the milk yield of daughters was within 86.1-98.6 %, in terms of the mass fraction of fat they exceeded mothers and amounted to 102.7-108.4 % and by mass fraction of protein - 95.2-104.9 %.

Physical-chemical parameters of milk of the Holstein cows of the Hungarian selection, which determine the quality of milk, were studied by the second lactation and taking into account the genealogical affiliation. The cows of the Holstein breed of the Hungarian selection had insignificant differences in the physical-chemical parameters of milk. The density was within the normal range and was 1027-1028 kg / m^3, taking into account the genealogical affiliation and the acidity was the same (16 ^oT).

The maximum amount of dry matter was in the milk of the daughters of the bulls of the Montvik Chiftain and Reflection of Sovering lines - 12.97-12.94 %, including MSNF - 8.51 %, fat content - 4.43-4.46 % and protein - 3.63 % (Table 5).

Table 5: Physical and chemical parameters of cows' milk, depending on genealogical line

Parameter	Genealogical line		
	Montvik Chiftain	Vis Beck Idiala	Reflection of Sovering
Density, kg / m^3	1028±0.0	1027±0.0	1028±0.0
Acidity, ^oT	16±0.0	16.0±0.0	16.0±0.0
Mass fraction of fat, %	4.46±0.2	4.51±0.16	4.43±0.2
Mass fraction of protein, %	3.63±0.02	3.03±0.02	3.63±0.02
Mass fraction of lactose, %	4.80±0.04	4.80±0.04	4.80±0.04
Dry matter, %	12.97±0.02	12.91±0.03	12.94±0.01
MSNF, %	8.51±0.06	8.4±0.07	8.51±0.06
Temperature, ^oC	21.5±0.18	21.4±0.1	21.5±0.14

Note: * - The results are reliable with P ≥0.95; ** - P ≥0.99; *** P ≥0.999

Daughters of bulls of the Vis Beck Idiala line had a maximum butterfat percentage of 4.51 %. However, the protein content in the milk of these cows was minimal and amounted to 3.03 %.

The economic efficiency of breeding cows of the Hungarian selection was determined taking into account the cost of milk, selling prices and revenues. The level of profitability of milk production for cows of the Hungarian selection was 68.5 %.

4. Discussion

Holstein cattle is the result of long-term breeding work and is in demand in many countries of the world [9, 11, 12]. When loose housing and balanced feeding, the yield of Holstein cows in the pedigree herds of the Russian Federation reaches 8,000–10,000 kg, and the average yield of Holstein cows in commodity farms are at the level of 6,000–7,000 [1, 2]. The modern dairy type of livestock differs in its economic and biological parameters from the black-and-white type of European countries [22-25]. An important factor in breeding of Holstein cattle is the conditions for increased comfort and the provision of animals with high-quality feed in accordance with the physiological state [3, 7, 8, 29].

In order to realize the genetic potential of the black-and-white cows of the Holstein breed of the Hungarian selection, the pedigree breeding unit of Ryazan oblast created comfortable conditions for year-round housing. A continuous-shop technology of milk production was organized at the reconstructed milk complex. The feeding of dairy cows throughout the year was carried out with feed mixtures, taking into account the needs and lactation performance. The control of feeding dairy cattle was carried out on the biochemical parameters of cows' blood.

Black-and-white Holstein cows had economic and biological characteristics, due to age and genealogical affiliation. The Reflection of Sovering cows had the maximum live weight in the third lactation - 568.7 kg. The minimum duration of the service period was for animals of the Vis Beck Idiala line - 152.3 ± 13.7 days and the dry period was 55.6 ± 2.7 days. Cows belonging to the Montvik Chiftain line had the maximum milk ejection rate of 1.55 ± 0.22 kg / min average for 3 lactations.

For an average of three lactations, the maximum milk yield was obtained from the cows of the Vis Beck Idiala equal to 6,373.7 kg. Cows of this line gave 20,880.9 kg of milk for three full lactations. The maximum yield of milk fat was obtained from the Reflection of Sovering line - 791.2 kg and the maximum protein yield from the Vis Beck Idiala line was 656.9 kg.

Realization of genetic potential of Holstein cows of the Hungarian selection by the milk yield for the third lactation was within 86.1-98.6 %, by the mass fraction of fat exceeded the mothers and amounted to 102.7-108.4 % and by the mass fraction of protein it was 95.2-104.9 %.

Physical and chemical parameters of milk were within the normal range and there were no significant differences depending on the genealogical affiliation.

5. Conclusions

1. In order to realize the genetic potential of the black-and-white cows of the Holstein breed of the Hungarian selection, the pedigree breeding unit of Ryazan oblast created comfortable conditions for year-round housing. A continuous-shop technology of milk production was organized at the reconstructed milk complex. The feeding of dairy cows throughout the year was carried out with feed mixtures, taking into account the needs and milk production. The control of feeding the dairy cattle was carried out on the biochemical parameters of cows' blood.

2. The cows had the maximum live weight in the third lactation. The animals of the Reflection of Sovering line were 568.7 kg, which was 17.1 kg or 3.1 % more as compared to the animals of the Vis Beck Adiala line and 3.4 kg or 0.6 % as compared to the Montvik Chiftain line.

3. The duration of the dry period was within the physiological norm and was 52.7-63.7 days. The duration of the service period in Holstein cows of the Hungarian selection was relatively high and was within 152.3-181.5 days, the minimum duration was for animals belonging to the Vis Beck Aidiala line - 152.3 days.

4. The intensity of milk ejection was at the level of 0.93-1.76 kg / min and increased from the first lactation to the third one by 0.32-0.59 kg / min or by 26.6-34.5 %. Over the course of three lactations, cows belonging to the Montvik Chiftain line had the best intensity of milk ejection equal to 1.55 ± 0.22 kg / min.

5. The study of measurements of the exterior of the Holstein cows showed that they increased with age from the first lactation to the third one. Thus, the height of the cows at the withers in the first lactation was within 138.2-140.4 cm, an average of 138.7 ± 0.2 cm, and in the third lactation, this parameter increased by 5.7 cm or 4.1 % and was 144.4 ± 0.2 cm. Significant differences depending on the genealogical affiliation were not found. The daughters of the bulls of the Montvik Chiftain line had the maximum slanting length of the body in all three lactations and that was 173.2 ± 0.9-177.9 ± 1.3 cm. The daughters of the bulls of the Reflection of Sovering line of the second and third lactations had the maximum girth of the breast behind the shoulder blades and that was 192.0 ± 1.0-193.3 ± 1.2 cm.

6. Holstein cows of the Hungarian selection had exterior features due to the age and genealogical affiliation of the cows. The animals belonging to the Reflection of Sovering line had the best commercial-biological traits.

7. The milk production of the Hungarian cows increased from the first to the third lactation by 1,156-1,419 kg or by 19.7-25.4 %. The maximum increase in milk yield on average for three lactations was given by Reflection of Sovering cows and that was 1,419 kg or 25.4 % higher as compared to the first lactation milk yield.

8. A comparative evaluation of lactation performance of cows, depending on their genealogical affiliation, showed that the maximum lactation performance was obtained from cows of the Vis Beck Idiala line: for the third lactation it was 7,034 kg with 3.99 % fat content and an average one of three lactations was 6,373.7 kg, and the milk ratio was 1,192.2 kg.

9. The mass fraction of fat in the milk of cows of the Holstein breed of the Hungarian selection was at the level of 4.0 % and higher. The maximum parameter of fat in milk on average for three lactations was 4.16 % and it was obtained from the Montvik Chiftain cows when the milk fat was 259.2 kg. The maximum yield of milk fat was obtained from the Reflection of Sovering line and that was 791.2 kg.

10. The mass fraction of protein in milk on average across all the lines studied by us was in the range of 3.11-3.21 %. The maximum protein content in milk was observed in daughters of bulls of the Reflection of Shovering line in the third lactation and that was 3.21 %. The maximum protein yield due to high productivity was obtained by the Vis Beck Idiala line equal to 656.9 kg.

11. The results of studying the lactation performance of cows for three full lactations showed that the largest amount of milk was obtained from the Vis Beck Idiala cows - 20,880.9 kg, which was 3,152 kg or 17.8 % more as compared to the performance of the Montvik Chiftain cows and by 1,514.8 kg or 7.8 % more as compared with the performance of the Vis Beck Idiala cows.

12. The realization of the genetic potential for the third lactation in daughters' milk yield was within 86.1-98.6 %, in terms of the mass fraction of fat exceeded mothers and was 102.7-108.4 % and by mass fraction of protein it was 95.2-104.9 %.

13. The cows of the Holstein breed of the Hungarian selection had insignificant differences in the physical-chemical parameters of milk. The density was within the normal range and was 1027-1028 kg / m^3, taking into account the genealogical affiliation, the acidity was the same and was 16 ^{o} T. The maximum amount of dry matter was in the milk of the daughters of the bulls of the Montvik Chiftain line and the Reflection of Sovering line - 12.97-12.94 %, including MSNF - 8.51 %, fat content - 4.43-4.46 % and protein - 3.63 %. Daughters of bulls of the Vis Beck Idiala line had the maximum butterfat percentage of 4.51 %. However, the protein content in the milk of these cows was minimal and amounted to 3.03 %.

14. The economic efficiency of breeding cows of the Hungarian selection was determined taking into account the cost of milk, selling prices and revenues. The level of profitability of milk production for cows of the Hungarian selection was 68.5 %.

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