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ВЕСТНИК

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NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

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DAIRY PRODUCTIVITY OF HOLSTEIN COWS OF DIFFERENT BREEDINGS UNDER THE CONDITIONS OF COMMERCIAL DAIRY FARMS

Abstract. This work aims to identify the level of productivity of Holstein cows of different breedings.

The experimental studies were performed using purebred Holstein animals imported from Germany, Hungary, and Finland.

When studying the exterior-constitutional features of livestock raised on the farm, it was found that Holstein cows as a whole were characterized by a relatively strong constitution, a proportionally developed and slightly elongated body with average live weight, deep chests with well-defined milk veins, glandular and properly attached bath-like and cup-shaped udder, with an average intensity of milk yield (2.12-2.4 kg/min). According to the expressiveness of dairy forms, the best indicators were for animals of Hungarian breeding with the linear affiliation of Reflection Sovering, and in cows of German and Finnish breedings - Montwik Chieftain.

A study of the dairy productivity of cows showed that the greatest milk yield over 305 days for three lactations, depending on the linear affiliation, was for Hungarian cows: during the 1st lactation - 6465.9-6951.2 kg, the 2nd lactation - 7463.5-7706.2 kg, according to the 3rd lactation - 8254.2-8297.7 kg of milk.

A comparative evaluation of the dairy production of cows showed that the highest dairy productivity was noted in cows of the Reflection Sovering line. Thus, the average milk yield in cows of this line in the first three lactations was higher than in analogs of the Finnish breeding by 885 kg (13.02%) and German one - by 892 kg or 13.1% ($P<0.05$), Vis Beck Ideal by 444.5 kg (6.2%) and 807 kg or 12.0% ($P<0.01$) respectively. The animals of the Montwik Chieftain line of the Hungarian breeding exceeded in the milk yield of the German cows by 176.5 kg (2.4%) and the Finnish cows by 238.2 kg or 3.3%. Indicators of the coefficient of variation in milk yield show that the herd of Holstein cows in the first and third lactations is very heterogeneous. According to the second lactation, the representatives of the Vis Beck Ideal line of the German selection and the Montwik.

It was established that in the coefficient of consistency of lactation, cows of German breeding exceeded the analogs of the Finnish and Hungarian breedings by 4.7 and 6.7%, respectively. Herewith, in the Hungarian cows, the lactation full value indicator was higher by 18.3% and 1%, which indicates higher stability of milk yield of cows of this group for the entire lactation.

In such a way, our analysis of the morphofunctional properties of the udder showed that the investigated groups of animals correspond to the technological requirements for industrial keeping technology and organizing machine milking.

Key words: cows, selection, lines, lactation, exterior constitutional features, dairy productivity.

Introduction. Increasing milk production and improving its quality have been and remain one of the priority tasks of animal husbandry in the countries of the Eurasian Economic Union (EAEU) [1].

Its solution should be based on the intensification of dairy farming, the main factor of which is to improve the genetic potential of cattle [2, 3, 4, 5].

At the present stage of development of dairy cattle breeding, there is an advance in the breeds of dairy, meat, and combined directions of productivity using high productive breeds of the world gene pool, in particular, the Holstein [6, 7, 8].

The productive traits of farmed breeds of dairy cattle are largely determined by their genotype. In this regard, in recent years, much attention has been paid to the study of biological characteristics and the identification of adaptation processes that affect the realization of the genetic potential of cows, to organize further breeding with imported livestock and their offspring [9, 10, 11].

To date, the issues of the impact of the origin country of the imported livestock on the productive traits of the Holstein cows due to the peculiarities of the formation and improvement of breeding herds have not been fully studied.

This work aims to identify the level of productivity of Holstein cows of different breedings.

Materials and methods. The experimental studies were performed using purebred Holstein animals imported from Germany, Hungary, and Finland.

The feeding and keeping conditions of the experimental cows were the same following the technology adopted at the farm. In the stall period, cows were kept loose in four-row typical cowsheds. Feeding and milking were carried out according to the common daily routine at the farm, on a high-performance Farmtec herringbone milking device. In the summer, cows were kept in the pen without grazing.

Under the aim and objectives of the study, out of 886 cows of the herd, three groups of 21 animals in each were formed - analogs taking into account age, selection, and linearity of 7 animals each (Montwik Chieftain 95679, Vis Beck Ideal 0933122, Reflection Sovering 198998).

Cows belonging to different lines and breeding, as well as reproductive qualities were determined based on an analysis of the genealogical structure of the herd, using breed certificates, cards, artificial insemination journals, and other documents of primary zootechnical registration.

Exterior-constitutional features of cows were studied to determine the physique type and direction of productivity by taking 7 basic measurements of the body, followed by the calculation of 6 physique and photographing indices. The animals were measured three hours after feeding, 6 animals in each group.

The live weight of cows was determined at 3 months of appropriate lactation by individual weighing in the morning before feeding.

Dairy productivity of cows was determined according to computerized data, the intensity of milk transfer using the Dairymaster program.

To determine the quality indicators of milk, an average sample was taken for two adjacent days. The chemical composition of milk was determined in the laboratories of the departments of private zootechnics and animal breeding; physiology, biochemistry, and animal feeding of the Bashkir State Agrarian University.

The morphofunctional properties of the cow udder were studied by the method of F.L. Harkavi "Evaluation of the udder and milk yield of cows of dairy and dairy-meat breeds", and productive longevity according to zootechnic records for all lactations.

All considered indicators of the scientific and economic experiment were subjected to biometric processing by the method of variation statistics.

Results. The farm uses a hay-concentrate type of cow feeding, balanced in terms of the basic nutrients content following the developed standards by FSC for animal husbandry.

To compensate for the deficiency of protein, as well as minerals and vitamins in the production of compound feed on the farm it is used sunflower meal and premix.

In the stall period, in the diet structure of the total nutritional value, rough forage accounted for about 10%, succulent and watery forage - 46.4%, including silage - 20, haylage - 14.4, root crops - 12% and concentrated (including carbohydrate) - 44.0%.

With an eye to 100 kg of live weight, 3.3 kg of dry matter with a concentration of 1 kg - 10.8 MJ of exchange energy were accounted for. For 1 EFU, 100 g of digestible protein was accounted for, with a sugar-protein ratio of 0.9-1.0.

In the summer period, according to nutrition, the share of concentrates in the structure of the diet accounted for 46.2%, green mass - 26.8%, hay - 9.0%, and molasses - 8.0%. 10.6 MJ of exchange energy accounted for per 1 kg of dry matter and 102.5 g of digestible protein per 1 ECE.

When studying the exterior-constitutional features of livestock raised on the farm, it was found that Holstein cows as a whole were characterized by a relatively strong constitution, a proportionally developed and slightly elongated body with average live weight, deep chests with well-defined milk veins, glandular and properly attached bath-like and cup-shaped udder, with an average intensity of milk yield (2.12-2.4 kg/min). According to the expressiveness of dairy forms, the best indicators were for animals of Hungarian breeding with the linear affiliation of Reflection Sovering, and in cows of German and Finnish breedings - Montwik Chieftain.

Our research has established that no significant differences in the live weight of cows depending on their origin have been identified. Herewith, during the first two lactations, some advantage was observed in the group of cows of German breeding (523.2-554.5 kg), and subsequently in Hungarian (547.3-594.1 kg).

At the same time, Hungarian cows were characterized by better linear growth indicators and exceeded the German selection analogs in height at the withers by 1.6 cm, in chest width - by 1.8 cm, in oblique body length - by 5.0 cm, in chest depth - by 4.6 cm ($P<0.05$) and in chest girth - by 5.6 cm, inferior to the cows of the Finnish breeding in chest girth by 2.4 cm and chest depth by 2.2 cm ($P<0.05$). In the chest breadth, the representatives of the Finnish breeding exceeded their German peers by 4 cm ($P<0.05$).

Cows of Hungarian origin were characterized by a greater elongation by 7.3% and significantly ($P<0.05$) exceeded their analogs in Finnish breeding, and in terms of blockiness rate, thoracic and pelvic-thoracic index by 9.0%; 1.4% and 5.3%, respectively ($P<0.05$).

Thus, Hungarian cows had a more expressed exterior characteristic of high productive dairy cattle.

A study of the dairy productivity of cows showed that the greatest milk yield over 305 days for three lactations, depending on the linear affiliation, was for Hungarian cows: during the 1st lactation - 6465.9-6951.2 kg, the 2nd lactation - 7463.5-7706.2 kg, according to the 3rd lactation - 8254.2-8297.7 kg of milk (Table 1).

Table 1 - Milk yield of Holstein cows of different genotypes for 305 days of lactation

Line	German breeding		Finnish breeding		Hungarian breeding	
	M±m	Cv,%	M±m	Cv,%	M±m	Cv,%
First lactation						
Vis Beck Ideal 0933122	5609.5±445.40	19.8	6554.3±318.6*	14.4	6811.6±406.51**	10.9
Montwik Chieftain 95679	6463.5±336.93	12.8	6312.7±405.31	15.6	6465.9±312.2	10.9
Reflection Sovering 198998	6343.3±409.69	16.1	6357.2±319.05	11.4	6951.2±423.2*	16.7
Second lactation						
Vis Beck Ideal 0933122	6995.5±197.67	7.1	7082.9±266.8	23.1	7463.5±192.13	14.3
Montwik Chieftain 95679	7321.7±740.09	24.8	7384.5±305.5	12.9	7505.1±214.12	6.1
Reflection Sovering 198998	6754.7±496.74	23.0	6809.7±345.1	11.4	7706.2±565.17*	17.8
Third lactation						
Vis Beck Ideal 0933122	7546.8±496.31	13.2	7603.3±320.7	20.2	8297.7±265.31*	11.1
Montwik Chieftain 95679	7910.35±509.15	18.4	7813.5±369.7	11.4	8254.2±202.54	16.1
Reflection Sovering 198998	7244.35±234.15	14.5	7195.4±289.35	13.3	8359.45±311.26*	10.5

*P<0.05; P**<0.01

A comparative evaluation of the dairy production of cows showed that the highest dairy productivity was noted in cows of the Reflection Sovering line. Thus, the average milk yield in cows of this line in the first three lactations was higher than in analogs of the Finnish breeding by 885 kg (13.02%) and German one - by 892 kg or 13.1% (P<0.05), Vis Beck Ideal by 444.5 kg (6.2%) and 807 kg or 12.0% (P<0.01) respectively. The animals of the Montwik Chieftain line of the Hungarian breeding exceeded in the milk yield of the German cows by 176.5 kg (2.4%) and the Finnish cows by 238.2 kg or 3.3%. Indicators of the coefficient of variation in milk yield show that the herd of Holstein cows in the first and third lactations is very heterogeneous. According to the second lactation, the representatives of the Vis Beck Ideal line of the German selection and the Montwik Chieftain of the Hungarian breeding, the coefficients of variation are significantly smoothed.

The analysis of the physicochemical indicators of milk in experimental cows indicates that significant differences were revealed only in fat content. As a result, the milk of the Hungarian cows was characterized by the lowest dry matter content and higher density. According to the fat content in milk, the German cows exceeded the Finnish analogs and Hungarian counterparts by 0.24 and 0.42%, respectively. In our opinion, this may be due to the peculiarities of breeding work aimed at increasing the fat content of herds (Table 2).

It was established that in the coefficient of consistency of lactation, cows of German breeding exceeded the analogs of the Finnish and Hungarian breedings by 4.7 and 6.7%, respectively. Herewith, in the Hungarian cows, the lactation full value indicator was higher by 18.3% and 1%, which indicates higher stability of milk yield of cows of this group for the entire lactation (Table 3).

Table 2 - Physico-chemical indicators of cow milk

Indicator	Breeding		
	German	Finnish	Hungarian
Dry matter, %	12.68±0.06	12.52±0.04	12.3±0.02
nonfat milk solids, %	8.38±0.08	8.46±0.06	8.42±0.1
Fat content, %	4.30±0.02	4.06±0.03	3.88±0.02*
Protein content, %	3.22±0.02	3.24±0.01	3.30 ±0.01
Lactose, %	4.52±0.04	4.60±0.04	4.44±0.05
Minerals, %	0.64±0.11	0.62±0.08	0.68±0.09
Density, °A	28.20±0.41	28.48±0.56	30.10±0.1
Acidity, °T	16.3±0.01	16.32±0.13	16.4±0.13

*P<0.05

Table 3 - The coefficients of consistency and full value of lactation of cows, (M±m)

Indicator	Breeding		
	German	Finnish	Hungarian
Milk yield for 305 days of lactation, kg	6995.1±139	6962.5±127	7524.3±153*
The highest daily milk yield, kg	26.5	27.9	30.9
Coefficient of consistency of lactation, %	86.5	81.8	79.8
Coefficient of the full value of lactation, %	83.7	101	102

*P<0.05

The suitability of cows for industrial keeping technology is largely determined by the morphological and functional properties of the udder (Table 4).

Table 4 - Morphological and functional properties of the udder of cows of different breeds, (M±m)

Indicator	Breeding		
	German	Finnish	Hungarian
width	35.9±1.21	36.1±1.29	36.9±1.33
length	42.7±1.25	43.6±1.12	45.4±1.14
Horizontal girth	122.6±3.39	124.3±3.6	127.7±4.1
Forequarters depth	31.4±1.44	32.3±1.5	32.7±1.52
Daily milk yield, kg	26.5 ± 0.67	28.55 ± 0.71*	31.33 ± 0.83**
Milking time, min	12.52 ± 0.16	12.6 ± 0.23	13.0± 0.28
The milk flow rate, kg/ min	2.12 ± 0.04	2.26 ± 0.05*	2.41 ± 0.07*

P*<0.05; P**<0.01

It was found that, according to the main udder measurements, the cows of the Hungarian breeding were distinguished by higher indicators. They had a larger udder length by 2.7 cm and 1.8 cm and an udder girth by 5.1 cm and 3.4 cm or 4.2-2.7% compared with measurements of German and Finnish cows.

It was established that the Hungarian cows also differed by a higher milk flow rate (the amount of milk milked per 1 minute). With a daily milk yield of 31.33 kg (P<0.01), their milk flow rate was 2.41 kg/min (P<0.05), while in the Germans with a daily milk yield of 26.5 kg, the studied indicator was equal to 2.12 kg/min. In cows of Finnish breeding, the milk flow rate was 2.62 kg/min (P<0.05) with a daily milk yield of 28.55 kg.

In such a way, our analysis of the morphofunctional properties of the udder showed that the investigated groups of animals correspond to the technological requirements for industrial keeping technology and organizing machine milking.

Conclusion. Thus, new data on the feasibility of using Holstein cows of different breeds have been obtained, some paratypical factors have been substantiated that contribute to the manifestation of the high genetic potential of dairy productivity. An additional reserve has been identified for increasing milk production and improving its quality through the rational use of Holstein cattle in industrial technology.

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СҮТ – ТАУАР ФЕРМАЛАР ЖАҒДАЙЫНДА ТҮРЛІ СЕЛЕКЦИЯДАҒЫ ГОЛШТИНДЕРДІҢ СҮТТІ ӨНІМДІЛІГІ

Аннотация. Жұмыстың мақсаты – өсіру барысында түрлі селекциядағы Голштеин сиыр тұқымдарның өнімділік деңгейін анықтау.

Тәжірбиелік зерттеулер Германия, Венгрия және Финляндия елдерінен әкелінген таза тұқымды Голштеин жануарларымен жүргізілді.

Шаруашылықтағы жануарлардың сыртқы – Конституциялық ерекшеліктері Голштеин тұқымдары жалпы алғанда мықты Конституцияға ие, орта массалы сиырларда ұзынша келген дене тұрқымен, жақсы жетілген сүтті тамырлармен, ванна тәрізді және табақша тәрізді формалармен сипатталады. Сүт берудің орташа интенсивтілігі (2,12-2,4 кг/мин). Сүтті формалары бойынша венгер селекциясының Рефлекшн, Соверинг линиялы шығу тегі иелері, неміс және фин сиырлары - Монтвик Чифтейн.

Сиырлардың сүт өнімділігін зерттеулер көрсеткендей, үш лактация бойынша 305 күн сауым мерзімінде Венгр селекция сиырлары өнімділікті көрсетті: I лактация – 6465,9-6951,2 кг, II лактация – 7463,5-7706,2 кг, III лактация – 8254,2-8297,7 кг /сүт.

Сиырлардың сүт өнімділігінің салыстырмалы бағалауы көрсеткендей, ең жоғары сүт өнімділігі Рефлекшн Соверинг сиыр линияларынан алынды. Аталған линия сиырларының алғашқы үш лактация бойынша орташа сауым жоғары болды, фин селекциясы 885 кг (13,02 %) және немісте - 892 кг немесе на 13,1 % (P<0,05), 892 кг или на 13,1 % (P<0,05), сәйкесінше Вис Бек Айдиал линиясы 444,5 кг (6,2 %) және 807 кг немесе на 12,0 % (P<0,01).Венгер селекциясының Монтвик Чифтейн линиясының жануарлары неміс селекциясы аналогторынан 176,5 кг (2,4%) және фин селекциясынан 238,2 кг немесе

на 3,3% басым болды. Сүт шығымдылығының өзгеру коэффициентінің индикаторлары бірінші және үшінші лактация кезеңіндегі Голштейн сиырларының табы өте гетерогенді екенін көрсетеді. Екінші лактацияға сәйкес Вис Бек Айдиал желісінің өкілдері және Венгриялық Монтвик Шифтейн, вариация коэффициенттері айтарлықтай теңестіріледі.

Лактацияның тұрақтылық коэффициенті бойынша неміс селекциясының сиырлары Фин және Венгр аналогтарынан 4,7 және 6,7 % басым болды. Алайда, Венгр селекциясының сиырларының лактация толықтығының көрсеткіші 18,3 және 1% жоғары болды, ол аталған сиырлардың сауым тұрақтылығы жоғары болды.

Сонымен, желіннің морфофункционалды қасиеттерін талдауға арналған жұмыстарды қорытындылай келе, зерттелген топ жануарлары технологиялық талаптарға сай келеді және машинамен сауууға ұйымдастыруға болады.

Түйін сөздер: сиырлар, селекция, сызықтар, сыртқы – Конституционды ерекшеліктер, сүт өнімділігі.

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МОЛОЧНАЯ ПРОДУКТИВНОСТЬ ГОЛШТИНОВ РАЗНЫХ СЕЛЕКЦИЙ В УСЛОВИЯХ МОЛОЧНО-ТОВАРНЫХ ФЕРМ

Аннотация. Цель работы – выявление уровня продуктивности коров голштинской породы разных селекций при разведении.

Экспериментальные исследования выполняли на чистопородных животных голштинской породы, завезенных из Германии, Венгрии и Финляндии.

При изучении экстерьерно-конституциональных особенностей разводимого в хозяйстве скота установлено, что животные голштинской породы в целом характеризовались сравнительно крепкой конституцией, пропорционально развитым и слегка удлиненным туловищем со средней живой массой коров, глубокой грудью хорошо выраженными молочными венами, железистым и правильно прикрепленным выменем ваннообразной и чашеобразной формы, со средней интенсивностью молокоотдачи (2,12-2,4 кг/мин). По выраженности молочных форм лучшими показателями обладали животные венгерской селекции с линейной принадлежностью Рефлекшн Соверинг, а у коров немецкой и финской – Монтвик Чифтейн.

Исследование молочной продуктивности коров показали, что наибольший надой за 305 дней по трем лактациям в зависимости от линейной принадлежности был у коров венгерской селекции: по I лактации – 6465,9-6951,2 кг, по II лактации – 7463,5-7706,2 кг, по III лактации – 8254,2-8297,7 кг молока.

Установлено, что по коэффициенту постоянства лактации коровы немецкой селекции превосходили аналогов финской и венгерской – соответственно на 4,7 и 6,7 %. В то же время у коров венгерской селекции показатель полноценности лактации был выше на 18,3 и 1%, что свидетельствует о более высокой устойчивости удоев коров данной группы за всю лактацию.

Таким образом, проведённый нами анализ морфофункциональных свойств вымени показал, что исследуемые группы животных соответствуют технологическим требованиям, предъявляемым к промышленной технологии содержания и организации машинного доения.

Ключевые слова: коровы, селекция, линий, лактация, экстерьерно-конституциональные особенности, молочная продуктивность.

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