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IMPROVEMENT OF BREEDING AND PRODUCTIVE TRAITS OF KALMYK CATTLE BREED

Abstract. The article analyzes the state of Rostov type of the Kalmyk cattle breed on the main biological and productive features; it was studied the economic and breeding traits of livestock in various production systems. During the research, indicators of the formation of meat productivity of the newly created factory lines with different keeping technologies were established. New data on the index assessment of the genotype of servicing bulls by the phenotype of sons and daughters, as well as by the manifestation of the productive traits of the young stock, new type of Kalmyk cattle, depending on the origin and growing intensity in the preweaning and post-weaning periodswere obtained.

The research results serve as an important theoretical substantiation making a certain contribution to zootechnic science in order to improve the domestic livestock of meat productivity and can be used in practical work in the production of heavy carcasses and high-quality beef. This will increase the efficiency of the industry maintenance in a market economy and provide a more complete use of the productive capacity of the breed.

Key words: Kalmyk breed,intrabreed type, selection index, genealogical structure, growth, meat productivity, amino acid composition.

Introduction. The experience of economically developed countries shows that the independence of any state is largely determined by the ability to satisfy the population's need for food through its own production. In recent years, in Russia, there has been an almost double increase in consumption of poultry meat and pork of domestic productionon average per person per year, but the use of milk, dairy products,and beef has decreased. According to our calculations and the opinion of a number of experts, in order to satisfy the need for milk, dairy products and beef, it is necessary to have at least 12 million cows in the country with a yield of more than 5 thousand kg of milk per year and 50 kg beef production per head. At the same time, at the beginning of 2018, there were 8.2 million cows with productivity of 4.3 thousand kg of milk and a yield of meat products significantly less than 50 kg per head per year [1-4].

In Russia, the consumption of cattle meat per capita has decreased by 29% from the 1990 level and amounts to only 26% of the reasonable norm [5].

The global experience shows that in order to satisfy the population with beef at the expense of its own production, it is necessary to have one meat cow on each dairy cow [6-9]. Our preliminary calculations also showed that from dairy cattle breeding, even with intensive use of the entire super-replacement tock for meat production, it is possible to produce beef no more than 65% of the consumer demand. To meet a deficit of beef is possible only due to the development of the beef cattle industry. At the same time, although the volume of beef production at the expense of beef cattle has increased in recent years, the share of beef in the meat balance of the Russian Federation is still only 8–14%. The increase in the production of high-quality beef to the greatest extent meets both the requirements of organizing nutrition for the population and the rational use of food resources and the economic characteristics of individual zones and regions of Russia [3, 10, 11-14].

Beef cattle breeding is one of the foundations for ensuring the food security of Russia and the EEU countries. At the same time, along with the use of high-intensity breeds of western origin, the Kalmyk and Kazakh white-headed animals well adapted to the severe arid regions of our country are planned to be widely used. Currently, the share of these breeds accounts for more than 63% of the number of meat cattle breeds in Russia. It should also be noted that more than 50% of beef cattle are concentrated in the steppe and mountainous regions of the country, where natural and climatic conditions determine the development of beef cattle breeding as the most promising direction of animal husbandry. In these regions, it is not a competitor to intensive livestock industries that implement industrial production technologies [1, 15-18].

An essential requirement when breeding meat cattle is the use of animals with high energy growth and capable of highly efficiently convert the nutrients of vegetable feed into the development of muscle tissue. Therefore, in the selection and assortment, the focus is on animals with a clear manifestation of these qualities and having an excellent development of the musculature of the lumbosacral part of the body and hips. Unfortunately, these traits of animals have low levels of heritability and the effect of breeding cannot be high without an assessment of the offspring productivity and the combining ability of the lines [19-21].

In order to increase the volume of production of red meat in the Russian Federation, the industry targeted programs of Russia provide for the intensification of young stock breeding and raising the number of livestock of specialized meat breeds [22, 23]. Based on them, a basis will be created for the formation of a highly productive meat cattle breeding industry, capable, by 2022, of raising the share of meat cattle production in the total beef production to 35-40%.

Kalmyk is among the breeds that most effectively adapt to different climatic conditions and with balanced and even unbalanced feeding ensuring high energy growth and productivity. A desirable element of its breeding is the use in reproduction of linear animals. [8].

The aim of the research work was to study the various factors influencing the process of creating the Rostov-type Kalmyk cattle breed and the conditions for the maximum realization of its potential. For this purpose, the objectives were carried out to run a comparative analysis of the meat productivity formation of factory lines animals under the conditions of stalled-pasture and industrial technologies; to use computer technology in determining breeding value and identifying bulls-improvers when creating breeding stock of the desired type; assessment of meat quality indicators at different technology of young stock breeding.

Material and methods of the research. Studies on the breeding and productive qualities of Kalmyk cattle breed and the development of methods for their improvement have been carried out for 15 years in the stud factories of the Rostov region, at the department of private animal science and feeding of farm animals of the Don State Agrarian University, North-Caucasian branch of the Federal State Budgetary Institution of Science "Federal Research Center of Food Systems named after V. M. Gorbatov".

The experimental work was carried out in three stages. At the first stage, the animals' productivity of the newly created factory lines of the Kalmyk breed was assessed. At the second stage, a new method of index evaluation of the breeding value of servicing bulls was proposed and introduced. During the third stage, a comparative analysis of the Kalmyk, Hereford and Aberdeen-Angus breeds was conducted under the conditions of intensive completion of growing from 9 to 18 months of age in the industrial complex at full feeding with coarse and concentrated feeds.

For this, we used the multifunctional complex of computer programs “Breeding records in beef cattle breeding” (BRBCB) and electronic databases for a population of more than 70 thousand heads (registered in the unified register of intellectual property items 12 computer programs and electronic databases). On their basis, the analysis of the genealogical structure of cattle herds of breeding farms, the evaluation of the young animals by their own productivity and the servicing bulls by the quality of the offspring was made. For a more reliable assessment of the breeding value of beef cattle, we have developed and used a variant of the index assessing method of servicing bulls by the quality of offspring. To this end, by using theBRBCB software module, we sampled the productivity of the offspring of the estimated bull from the electronic database and calculated the selection index using the formulas: $СИ = СИ_Б + СИ_Т$,

$$СИ_Б = \sum_{i=1}^{N_{БNт}} [h^2_i(x_i - M_i)] + h^2_{МБ} * x_{МБ}; \qquad СИ_Т = \sum_{J=1} [h^2_J(x_J - M_J)] + h^2_{МТ} * x_{МТ},$$

where, number of traits of sons ($N_Б$) anddaughters ($N_Т$); live weight and average daily gain of sons of the estimated bull at different ages (i) anddaughters (J); trait heritability coefficient of herd (h^2); average assessment of meat forms of sons at the age of 15 months according to 20-point scale ($M_Б$) anddaughters ($M_Т$), etc. Herewith, mean values and biometric indicators of all analyzed traits, as well as selection indices, were determined automatically using the BRBCB computer program.

Depending on the level of manifestation and heritability of the traits taken into account, the selection index proposed by us may have a positive and negative value. The bulls with the index of 15 points and above are assigned the breeding category as "improver", with the index from 1 to 15 points - "neutral", and if it has from 0 points and below index - "deteriorator". The higher the index value, the higher the breeding value of the animal [24, 25, 2].

In the process of research and data analysis, we used monographic, statistical, economic and mathematical methods, as well as comparative analysis and theoretical generalization of the results. Growing calves after calving in the experiments was carried out at full suckling and using supplementary feeding at the rate of 0.7-1.8 kg of dry matter per head per day depending on age. After weaning from mothers, the assessment of the formation of meat productivity of young stock was carried out with a stall-pasture system and at keeping under conditions of a large industrial complex with full feeding for gaining at least 1000 g per day.

To study the meat productivity in the course of control slaughter, about 50 animals of Kalmyk and other meat breeds were used. Three animals from each group were selected on the principle of pair-analogues (by age, origin, and live weight). The slaughter qualities were determined by the pre-slaughter live weight, the hot carcass weight, the mass of the internal fat, the slaughter mass, the slaughter yield and the morphological composition of the carcass. To this end, after daily cooling for 24 h (at t from 0 to +4 °C), the boning of the left half carcass was carried out. Based on boning, the absolute and relative content of the flesh (including muscle and adipose tissue), bones, tendons, and fleshing index (output of the flesh part per 1 kg of bones) in the carcass were determined [21]. Physico-chemical parameters and amino acid composition of the rib eye were determined in the laboratory of Federal Research Center of Food Systems named after V.M. Gorbatov by generally accepted methods (GOST 34132-2017) [7].

Biometric processing of the obtained digital data was carried out according to the algorithms [26].

Research results and discussion. Of 11 beef cattle breeds, which were bred under the arid conditions of the steppe regions of the Rostov region during the period of the planned economy, only the Hereford and Kalmyk ones remain. Experts of stud farms and breeding units for breeding Kalmyk cattle distinguish its excellent adaptability to any climatic and forage conditions as advantages. The animals of this breed have a high reproductive ability, easy calving, good mobility, unpretentiousness to keeping conditions and level of feeding, the significant daily gain in live weight. They have fairly rapid recovery of live weight after a difficult wintering. Animals have the ability to forage from under the snow, deposit fatty tissue under the skin, around the internal organs, and between muscle fibers, providing protective and reserve functions, as well as tenderness, juiciness of beef and other desirable technological qualities [27, 3].

More than 40% of the breeding stock of the Kalmyk breed in the Russian Federation is concentrated in the stud farms and breeding units of the Southern Federal District. In the farms of the Rostov region, the share of Kalmyk cattle, as the most adapted to the conditions of arid steppe regions, accounts for more than 95% of the livestock. On their basis, at the beginning of 2019, seven stud farms and fourteen breeding units for breeding of the Kalmyk cattle breed were registered.

At the first stage of our work, in the process of analyzing an electronic database of the Kalmyk cattle breed of leading stud farms and breeding units of the Rostov region, it has been established that over the past 15 years, bulls of three genealogical groups and nine genealogical lines have been used in the reproduction of the herd of the region. The genealogical group is understood as several factory lines and related groups formed on the basis of the genealogical line. In the process of targeted selection in each genealogical group (GG), 2-3 factory lines (FL) and related groups (RG) were formed. Particularly distinguished is the genealogical group of Block 3218, on the basis of which 3 factory lines and a related group were created. It is the most saturated with highly productive continuators. For 15 analyzed years, 346 servicing bulls of this group have worked in the herd of farms. Its share in the total genealogical structure of the analyzed population accounts for more than 43% of the animals. Continuators of the factory lines of

this group are ranked first in prevalence in the farms of Kalmykia, Stavropol, Kuban and the Rostov region. On its basis and on the basis of the genealogical groups of Leleshko 15 and Simmer 7333, in 2015, the factory lines of the Pirat 6626, Pokhvalniy 8643, Ozhog 6136 were approved and the creation of new factory lines based on the related groups of the Abazhurny0601, Rogalik 0899 and Desert 93084 continues (figure 1, 2). Almost 55% of the animals in the general genealogical structure of the Kalmyk cattle herds of analyzed breeding farms is accounted for the share of continuators of these lines and groups (table 1).

When creating new factory lines, at the initial stage of work, for a servicing bull, valuable similar females were selected. The first generation, derived from the bull, was material for the accumulation and consolidation of valuable features of the ancestor.

At this stage of breeding, it was allowed a moderate degree of inbred mating. In the factory line, we included only those animals that met the requirements of the target standard of the line developed by us, were associated with the ancestor through male and female descendants and corresponded to the tasks of breeding work [27-29].



Figure 1 – Bull of the Kalmyk breed 6951 on pasture (Pokhvalniy line 8643)



Figure 2 – Bull of the Kalmyk breed 7527 (related group of the Abazhurny 0601)

Table 1 – The structure of the livestock of the Kalmyk cattle breed of the Rostov region

Genealogical group (GG), factory line (FL), genealogical line (GL) ıгelated group (RG)	Total, heads	Including, heads			Specific gravity, %
		Servicing bulls	cows	Replacemen theifers	
GG of Blok 3218	7061	346	3829	2886	43,23
incl.FL of Moryak12054	1660	69	864	727	10,16
FL of Pirat 6626	1833	103	975	755	11,22
FL of Pokhvalniy 8643	1370	66	769	535	8,39
(RG) Abazhurny 0601	673	28	435	210	4,10
GG of Leleshko 15	2504	118	1512	874	15,33
incl.FL of Duplet 825	1397	63	774	560	8,55
(RG) Rogalik 0899	517	20	356	141	3,16
GG ofSimmer 7333	2404	112	1309	983	14,72
incl.FL of Ozhog 6136	888	31	478	379	5,44
(RG) Desert 93084	522	23	367	132	3,19
GL ofManezh 7113	2099	79	1052	968	12,85
GL of Mushket 5277	354	10	246	98	2,17
GL of Motyga 1260	185	5	120	60	1,13
GL of Borovik7273	353	8	218	127	2,16
GL of Barzer7291	287	10	147	130	1,76
GL of Boyets 108	195	3	137	55	1,19
GL of Buket 7356	417	6	214	197	2,55
GL of Cenniy 6337	472	7	276	189	2,89
Total	16331	704	9060	6567	100

The creation of the Pirat 6626 line was aimed at the formation of animals with the qualities of long-body, high milking capacity and growth energy of the young stock. Sequential selection and assortment within the related group ensured the breeding of its best continuators. So, 3 of its grandsons - Yasenevy 8617, Manezh 61016, Pustyrnik 855 and 9 great-grandchildren surpassed their grandfather in terms of productivity and body build and left 4-5 sons and grandsons, which had expressed desirable qualities for this line.Their descendants are used as major servicing bulls in stud farms, reproducers and commodity farms in the Southern Federal District. The live weight of male descendants at the age of 3 years - 719-748 kg with the exterior assessment of more than 90 points. Their share, in the general genealogical structure of the herd of the analyzed farms, accounts for 11.2%.

The ancestor of the factory line, the Pokhvalniy 8643 bull, for 5 years, has maintained high growth energy, has had an enlarged body build with well-pronounced muscles of both the shoulder and pelvic girdle. Its live weight at 5 years of age was more than 900 kg with the exterior assessment of 95 points. Most of its descendants inherited well the development of the musculature of the shoulder and pelvic girdles and had the ability to maintain high growth energy for a long period even when mating with cows that had low productivity indices.Such prepotency became the basis for the creation of new factory line in order to increase the number of continuators with traits of the ancestor. In the process of selecting and evaluating their descendants by their own productivity and complex of traits, it was revealed that, having high growth energy from the first days of life, having reached live weight at 2 years of age of 535-580 kg, they continue to increase it to 865-920 kg at the age of 6. The continuators of this factory line in the future will contribute to an expansion in the number of heavy animals in the herd. The share of this line livestock accounts for more than 8.3% of the animals in the genealogical structure of the Kalmyk cattle recorded population.

Expansion in the number of animals of this line will have a positive effect on the consolidation of traits in the population of being created Rostov type of the Kalmyk breed.

The ancestor of the factory line, the bull Ozhog 6136 was bred on the basis of breeding in the Progress stud farm of one of the oldest and quite common in the breed, Simmer 7333 ORZH-73 genealogical group. The animals of this factory line are faster and longer-bodied than the mates of other lines. Moreover, the farm uses male and female individuals of the three branches of this line, but no significant differences were found between the bulls of different branches, indicating a consolidation of hereditary qualities. At the same time, according to the milking capacity of the cow, this line is 2-4% higher than the mates of other factory lines, and their further reproduction will make it possible to secure the high milking capacity and early maturity of animals in further generations (table 2).

Table 2 – Live weight and milking capacity of full-grown cows

Factory line	5 years old and older cows, heads	Averagelive weight, kg	Cows of the elite class and higher, %	Milking capacity (weight of calves at the age of 205 days), kg
Pirat 6626	775	514	104.2	188
Pokhvalniy 8643	569	519	106.1	191
Ozhog 6136	378	509	102.8	197

The continuators of the established factory lines and related groups are good breeding materials for the creation of the Rostov factory type of the Kalmyk breed. In recent years this work has increased its intensity by maintaining the tendency to leave the best continuators of the factory lines for the reproduction of the herd on the farms. The animals of the established factory lines in terms of productivity significantly exceed the requirements of the top classes and average indicators of the analyzed lines (table 3).

Table 3 – Average live weight of the different lines servicing bulls, kg

Genealogical group (GG), factory line (FL), genealogical line (GL) ирelated group (RG)	N	Age, years			
		3		5 and older	
		X±Sx	Cv,%	X±Sx	Cv,%
GGof Blok 3218	180	717.3±21.5	6.1	869.3±19.5	11.2
Incl.FL of Pirat 6626	38	729.5±20.2	10.3	875.5±17.2	14.1
FL of Moryak 12054	39	712.3±22.4	12.9	859.3±13.1	16.0
FL of Pokhvalniy 8643	24	725.0±14.0	8.5	871.4±10.2	11.3
(RG) Abazhurny0601	17	721.9±23.9	12.5	868.9±15.1	18.0
GG of Leleshko 15	45	733.3±20.5	20.5	859.9±21.0	14.3
Incl.FL ofDuplet 825	12	728.5±12.2	17.7	872.1±12.3	15.1
RGofRogalik 0899	13	738.3±23.4	19.2	869.7±14.2	16.4
GG of Simmer 7333	37	726.7±26.4	11.8	868.3±14.1	14.7
Incl.FL of Ozhog 6136	17	731.0±20.0	21.0	872.8±16.0	16.2
RG of Desert 93084	11	728.2±18.2	14.0	863.3±12.0	13.1
GL of Mushket 5277	9	714.0±22.0	18.2	853.7±13.0	14.4
GL of Motyga 1260	4	696.0±17.0	10.4	840.4±16.2	13.2
GL of Manezh 7113	7	712.2±21.6	22.0	857.6±13.8	17.0
GL of Barzer 7295	2	716.7±11.4	9.6	854.8±12.0	5.4
Average	274	720.3±20.1	11.3	854.7±13.2	13.2

The Kalmyk breed cows of the analyzed livestock have good milking capacity and their descendants exceed the requirements of the elite class on average for 205 days in live weight (table 4).

Table 4 – Average live weight of Kalmyk cows of different lines, kg

Genealogical group (GG), factory line (FL), genealogical line (GL) ırelated group (RG)	N	Age, years			
		3	5 and older	Calves, days	
		X±Sx	X±Sx	1	205
GGof Blok 3218	973	423.3±21.5	532.0±16.1	22±1.3	189±7.3
Incl.FL of Pirat 6626	212	439.5±12.2	541.2±17.0	24±1.7	191±8.8
FL of Moryak 12054	198	426.3±13.4	522.4±14.3	22±1.4	184±7.7
FL of Pokhvalniy 8643	189	427.5±12.2	532.7±19.0	24±1.1	188±4.9
(RG) Abazhurny0601	174	424±11.2	521.2±12.3	23±2.0	187±3.5
GG of Leleshko 15	379	422.0±11.0	524.1±18.7	22±1.6	184±5.9
Incl.FL ofDuplet 825	129	422.1±20.0	522.7±19.0	23±2.0	186±7.1
RGofRogalik 0899	111	423.3±18.5	527.3±14.6	21±1.6	185±5.2
GG of Simmer 7333	351	421.3±13.4	519.3±17.0	23±1.8	182±8.1
Incl .FL of Ozhog 6136	219	426.7±16.4	522.2±14.3	21±1.5	186±7.2
RG of Desert 93084	105	423.0±18.0	523.4±13.2	19±1.6	185±7.1
GL of Mushket 5277	147	406.0±12.0	505.2±10.2	20±1.8	182±4.4
GL of Motyga 1260	119	404.0±7.0	502.7±11.3	19±1.3	170±5.3
GL of Manezh 7113	194	422.2±11.6	503.3±18.6	21±1.7	176±7.2
GL of Barzer 7295	118	416.7±10.4	510.1±18.7	20±1.4	171±8.0
Average	2281	424.0±8.1	517.2±19.7	22±1.6	181±3.3

This confirms the practicability of further expansion in the number of these animals and other continuators. It should be noted that animals of factory lines and related groups are well adapted to the hot arid climate. Even in arid 2007 and 2015, when there was not a single rain in the territory of the stud farms from April to October and temperatures exceeded 40 degrees in the steppe, young animals belonging to the Pirate 6626, Pokhvalniy 8643 and Ozhog 6136 retained leadership among their mates of other lines in live weight and in most exceeded the requirements of the first class.

To ensure interlinear heterosis, descendants of other lines are used, the livestock of which is kept at a small level. However, taking into account the fact that in recent years work is being done to increase the number of animals of the enlarged type, and their greatest number is recorded in the genealogical groups of Blok 3218 and Leleshko 15, therefore, in the long term, the selection of animals should be preferred to the continuators of these groups.

The descendants of the Musket 5277, Barzera 7295 and Manezh 7113 genealogical lines also have tallness and belong to the enlarged type. For example, the son of the Manezh 7113 bull Zapad 1205 with the live weight of 1035 kg became the champion of the breed at the exhibition. The grandson of Manezh and the son of Zapad, the bull Gordiy 1181 significantly exceeded its famous ancestors in this trait. However, the bulls of these lines due to their small size should be used mainly on commercial animals to obtain high-quality beef, since it is with this selection that they have proven themselves from the best side. In addition, their descendants have high resistance and survival. In addition, in young stock derived from interlinear crosses of the enlarged and compact types, heterosis is manifested in resistance, milking capacity, high growth energy over a long period and in live weight of the cows.

As a part of our research, it was established that the higher the live weight of the cows, the better the growth intensity of their descendants (table 5).

Table 5 – Live weight of cows and their milking capacity, kg

Live weight	n	Average live weight	Live weight of calves at the age of 7 months	Live weight of daughters at the age of 15 months	Live weight of sons at the age of 15 months
Up to 400	55	383	171.1 ± 12.4	306.2 ±12.5	342.0 ±9.6
401-450	80	430	183.0 ±9.6	312.8 ±9.6	369.0 ±12.3
451-500	190	481	194.8 ±9.3	319.7 ±10.4	379.8 ±8.5
501-550	155	533	199.4 ±8.6	334.4 ±9.1	386.1 ± 10.8
551-600	90	570	205.8 ±11.1	341.2 ±10.7	396.1 ±12.9
More than 600	35	610	211.5±7.8	353.1±8.6	413.5 ±9.7

With the intensive level of feeding, from heavy cows, the offspring is 10–20 kg heavier than from mates received from lightweight cows and with further growing, the former show a higher intensity of gain in live weight and form an enlarged body build. Among such animals, individuals that meet the requirements of the enlarged type standard are more common, and with the individual homogeneous selection, they produce highly productive offspring.

In the process of analyzing the electronic database, the coefficients of the relationship between various traits were calculated, which made it possible to reveal some influence of linear belonging on the manifestation of such indicators of interrelation as cow milking capacity and calves development in the suckling and post-weaning periods. Higher rates of the interrelation of traits were established in the groups of continuators of the genealogical groups of Leleshko 15 and Simmer 7333, as well as in the groups of cows of the factory lines of Pirate 6626 and Pokhvalniy 8643.Conspicuous is the fact that in full-grown cows of the analyzed lines, the height at hips is higher than the requirements of the elite-record class, with some advantage in favor of the animals of the genealogical groups and the Manezh 7113 line. However, there is no direct relationship between the height at hips indicators of cows and live weight of their offspring. Therefore, the selection on this basis will not contribute to the increase in live weight and milking capacity of cows, as well as the growth energy of young animals. Although these traits have a positive correlation and high rates of heritability coefficients (table 6, 7).

The continuators of the Ozhog 6136 and Pokhvalniy 8643 factory lines were revealed a significant effect of the live weight of the cows on milking capacity and live weight of offspring against the background of the pedigree factor of small-breeding and ease of calving.

Table 6 – Coefficients of heritability of meat productivity traits

Trait	Lineandpopulation				
	FL of Pirat 6626	FL of Pokhvalniy 8643	FL of Ozhog 6136	GL of Manezh 7113	For population
Liveweightatbirth.	0.64	0.67	0.76	0.58	0.66
Liveweightat 6 months	0.56	0.53	0.58	0.41	0.45
Liveweightat12months	0.41	0.49	0.53	0.44	0.47
Liveweightat18months	0.56	0.52	0.57	0.50	0.53
Live weight of first-calf cows	0.08	0.12	0.11	0.06	0.09
Exteriorassessment	0.63	0.58	0.71	0.67	0.66
Carcass weight of bull calves	0.66	0.54	0.63	0.60	0.61
Carcass weight ofheifers	0.42	0.46	0.40	0.41	0.42
Slaughter yield of bull calves	0.71	0.77	0.81	0.72	0.75
Slaughter yield ofheifers	0.55	0.62	0.68	0.63	0.61
Massofinternalfat	0.69	0.62	0.71	0.66	0.67
Muscletissueoutput	0.44	041	0.47	0.44	0.43

Table 7 – Phenotypic correlations of meat productivity traits

Trait	Line				
	Pirat 6626	Pokhvalniy 8643	Ozhog 6136	GL of Manezh 7113	For population
Live weight of cows and weight of calves at birth	0.12	0.17	0.36	0.28	0.25±0.034
Live weight and exterior assessment	0.24	0.33	0.46	0.39	0.35±0.022
Live weight at birth and at 12 months	0.18	0.19	0.21	0.24	0.27±0.024
Live weight at birth and at 18 months	0.10	0.12	0.11	0.16	0.13±0.039
Live weight of cows and their milking capacity	0.33	0.29	0.40	0.32	0.31±0.027
Height at hips of cows and their milking capacity	0.02	-0.03	0.01	-0.01	0.01±0.14
Live weight at 8 months of age and the average daily gain of bull calves up to 18 months	0.60	0.74	0.73	0.63	0.63±0.02
Live weight at 8 months of age and the average daily gain of heifers up to 18 months	0.48	0.63	0.66	0.61	0.51±0.041
Live weight at 8 months of ageandfeed costs per 1 kg weight gain of bull calves	0.76	0.79	0.82	0.82	0.82±0.033
Live weight at 8 months of age andfeed costs per 1 kg weight gain of heifers	0.70	0.72	0.80	0.83	0.76±0.039

No significant impact of calf weight at birth on the growth energy and the change in live weight during other age periods was noted. At the same time, these indicators have a high positive relationship with the level of feeding and the feed cost per 1 kg of gain.

The general conclusion on further work with the breed should be considered a priority for increasing milking capacity. Its positive result will significantly increase the live weight of young stock when weaned from mothers, that in the future will significantly affect the energy of their growth and increase in live weight at 12 and 18 months of age. This is confirmed by the high positive correlation between these traits, both in bulls and in heifers.

At the second stage of the research, in the course of the breeding experiment using a common data-base and the BRBCB software program, we tested the proposed methodology for assessing bulls in the quality of offspring based on the selection index.

When breeding meat cattle breeds, it is necessary to use animals in reproduction, which inherit high growth energy and the ability to actively convert the nutrients of plant foods to the development of muscle tissue. To identify them we should use the multi-year database of reliable data and the electronic operating system that could quickly analyze a large amount of information. This is connected with the fact that the manifestation of quantitative traits is due to the interaction of genetic and paratypical factors. If at this interaction between relatives there is a similarity in quantitative traits, it indicates a significant genetic influence, and such animals are the most desirable for breeding.

Using a block of a specially developed computer program, we estimated more than 80 servicing bulls in the quality of the offspring, and about 1000 animals of their sons were rated for their own productivity. In the process of comparative analysis, it was noted that the majority of estimated servicing bulls in sons' productivity (according to the current instructions) met the elite-record class by scoring and by complex index with a value of 101-106% - the "improver" breeding category.However, the assessment of bulls in the quality of offspring in terms of productivity of a limited number (10-20) of sons in optimal conditions is not always confirmed when they are used on a large scale for livestock of cows in other conditions of maintenance and growing of their offspring. In our opinion, in the reproduction of the herd the "complex bulls-improvers" of sons and daughters' productive traits should be used, information about which is formed on the results of the coverage of the maximum array of descendants of both sexes.Comparative assessment of the total productivity of sons and daughters with the calculation of the selection index (SI) turned out that the bulls of the Pirat 6626 factory line in group No. 2 (table 8) have a very low heritability index, negatively affect the productivity of sons and neutral for daughters. At the same time, for the majority of their descendants, the counted traits turned out to be below the average indicators of their

Table 8 – Comparative assessment of the bulls in the quality of offspring

Group number, ancestor of the line, Ind. No. of bulls	According to the current instructions			According to the selection index (SI)					
	number of sons	class	complex index, %	sons		daughters		total	
				N	SI	N	SI	n	SI
1. (FL) Pirat 6626, 9565, 0487, 1563	34	Elite-record	105.4	75	32.5	83	21.3	158	53.8
2. (FL) Pirat 6626, 9156, 1047, 3513	32	Elite-record	102.7	68	-3.3	78	1.2	146	-2.6
3. (FL) Pokhvalniy 8643, 2390, 1856, 3412	36	Elite.	99.6	72	31.6	85	27.9	157	59.5
4. (FL) Pokhvalniy 8643, 1393, 1637, 2128	34	Elite-record	101.2	77	21.4	80	-2.6	157	12.2
5. Duplet 825, 2280, 2317, 2309, 1838	45	Elite-record	102.3	86	14.9	93	22.1	179	37.0
6. Duplet 825, 2320, 2347, 2091, 1843	43	Elite-record	103.6	81	21.1	83	-2.6	164	18.5
7. (FL) Ozhog 6136, 3261, 3321, 0593, 2307	44	Elite-record	101.4	86	20.2	85	21.1	171	41.3
8. (FL) Ozhog 6136, 3696, 3318, 0691, 2318	43	Elite-record	102.9	72	18.1	82	-3.3	154	14.8
9. Moryak 12054, 0350, 1203, 2308	33	Elite-record	104.7	51	11.3	62	12.1	113	14.5
10. Moryak 12054, 7213, 1202, 1233, 0367	48	Elite-record	99.8	85	-5.5	109	0.6	194	-1.9
11. Moryak 12054, 7233, 1216, 1254, 0359	51	Elite-record	103.7	92	14.3	97	9.6	189	14.9
12. (RG) Desert 93084, 3944, 1741	24	Elite-record	104.7	29	8.2	21	13.2	50	12.4
13. Manezh 7113, 271	13	Elite-record	98.9	22	18.4	20	19.5	42	27.9

mates. Therefore, these bulls and their descendants have no positive value for breeding in this population and their use is undesirable in the reproduction of even commercial herds.

Another pattern was manifested in bulls of Pokhvalniy 8643 from group No. 3, which received the neutral category according to the current instructions. In this group, the average values of all productivity traits of female and male descendants significantly exceeded the average indicators of their mates, and the selection indices calculated by our method averaged 59.5 points. Therefore, they are “complex improvers” for sons and daughters and are recommended for insemination of the breeding nucleus of cows. A similar pattern was manifested in No.5, No.7 and No.13 groups.In groups No. 4, 6 and 8, the descendants of various factory lines worsen daughters, but improve sons, and bulls from groups 9, 11 and 12, marked as neutral for males and females, and therefore are not effective for selection in the breeding part of the herd, but can be recommended for use in a commercial herd. The bulls from groups No. 2 and 10 (descendants of the factory lines of the Pirat 6626, and Moryak 12054), having a negative value of the total selection index, are identified as “deteriorators” of sons and daughters. They are not recommended for use in farms of any status and are subject to rejection.

At mass analytical assessment of bulls in the quality of offspring in different breeding farms, it was revealed that only 47% of fathers used in reproduction, pass on their traits to the descendants of both sexes. About 40% of producers are “improvers” of only sons, and only 20% are “improvers” of daughters. Therefore, more than 50% of bulls "improvers" which received this breeding category when judging by the quality of offspring according to the current methodology of their assessment by sons, are not eligible for breeding, as they can be "deteriorators" of males or females.

Aconspicuous is the fact that descendants of bulls with the selection index (SI) of more than 20 points had a long body type and average daily gain is 14% higher in bull-calves and 8% higher in heifers compared with mates with SI less than 15 points.

It indicates that they are better adapted to local natural climatic and fodder conditions in comparison with mates from servicing bulls with a lower selection index. Therefore, at 15 months of age, bulls and heifers, obtained from "improvers" with SI more than 20 points, exceeded not only their mates from other bulls, but also the elite-record class requirements (table 9).

With the increase in the selection index above 30 points, in descendants, the average daily gain from 8 to 15 months of age exceeded 1000 g and at the end of this period, their live weight was much higher than the requirements of the elite-record class. Their sons were more extended and tall, with a deeper and wider breast, better developed hams, that is, significantly better pronounced meat forms.

Table 9 – Change in live weight of offspring of bulls with different selection index values

Selection index value (SI)	Sons					Daughters				
	n	Age (months) and live weight (kg)		Gain		n	Age (months) and live weight (kg)		Gain	
				daily, g	absolute, kg				daily, g	absolute, kg
		8	15				8	15		
-2.6	68	195±2.1	382±3.6	882	187	78	177±1.8	317 ±3.9	660	140
-1.9	51	199±1.8	389±3.8	896	190	62	181±1.6	323 ±3.5	670	142
12.2-14.9	402	211±1.4	415±3.3	962	204	425	186±1.7	329±3.2	675	143
18.5-27.9	103	212±1.9	420 ±3.3	981	208	103	188±1.9	336 ±3.4	698	148
37.0	86	213±2.0	425±3.5	1000	212	93	191±2.1	340 ±3.7	702	149
41.3	86	214±2.6	430 ±3.9	1019	216	85	196±2.0	346±3.8	707	150
53.8	75	218±2.1	441 ±3.0	1052	223	83	200±2.2	352 ±3.8	717	152
59.5	72	224±2.6	453 ±3.3	1080	229	85	202±1.9	356 ±3.1	726	154

The detected high-quality continuators of the factory lines comply with the requirements of the created interbreed type of enlarged long-bodied animals of the Kalmyk breed and are recommended for use in the reproduction of the breeding stock of agricultural enterprises and farms.

Evaluation of meat productivity was carried out by comparing the slaughter qualities of young animals of groups 1 and 2. The first group included the sons of bulls with the index below 30 points and the second group - above 30 points. In assessing the formation of meat productivity, the main indicators are the mass of carcass, its morphological composition and slaughter yield. These traits are caused by a complex of morphological features of the organism, which depend on heredity and environmental factors. In our studies, all the bull calves before slaughter had factory fatness and, in live weight at 8 months of age, in the first group, 97.6% met the requirements of the elite-record class, and in the second group - 104.9% (table 10). At the age of 15 months, these figures were respectively 110.0% and 117.2%. The resulting carcasses for slaughter met the requirements of the first category, had well-defined meat forms and, for 15-month-old bulls, were covered with a continuous layer of fat-watering, which prevents the meat from drying out.By pre-slaughter live weight, sons of bulls with the selection index of more than 30 points (group II) exceeded their mates from bulls with SI of less than 30 points (group I) at 8 months of age by 16.5 kg (7.5%), and at 15 months - by 27.7 kg (6.5%, $P<0.09$). Therefore, more heavy carcasses were obtained from the bulls of the II group, and they exceeded the bulls of the I group by almost 1% in the slaughter yield, and by 6-7% in the slaughter mass.

The same difference manifested itself in the morphological composition of the carcass. Bull calves of group I lagged behind their mates of the second group by 11–17 kg in mass of muscle tissue, and only by 2.6–2.8 kg in mass of bones. Therefore, they had a slightly lower fleshing index. The yield of these tissues in the bulls of the analyzed groups relative to the pre-slaughter body weight and chilled carcass revealed significant differences. Indicators of the development of these tissues and internal organs confirm the proportionality of their physique and the formation of meat productivity.

Table 10 – The results of the control slaughter of bull-calves (X±Sx)

Indicator	Group and age, months			
	I		II	
	8	15	8	15
Elite-record class requirements in live weight	225	385	225	385
Removableliveweight, kg	219.7±2.7	423.6±3.6	236.2±3.4	451.3±4.0
Pre-slaughter live weight, kg	206.8±3.2	408.3±3.1	218.7±2.6	433.7±3.8
Hotcarcassweight, kg	114.8±1.0	233.3±1.9	122.3±1.4	250.67±1.8
Carcassyield, %	55.5 ±0.11	57.1 ±0.09	55.9 ± 0.07	57.8±0.21
Mass of internal fat, kg	5.23±0.07	11.39±0.6	5.77±0.2	12.27±0.9
Yield ofinternal fat, %	2.53±0.03	2.79±0.04	2.64±0.08	2.83±0.05
Slaughterweight, kg	120.03±0.9	244.69±1.1	128.07±0.8	262.94±1.2
Slaughteryield, %	58.04±1.2	59.93±0.9	58.56±1.1	60.63±1.3
Carcass muscle tissue yield, %	74.8	75.1	74.9	75.6
Carcass fat tissue yield, %	5.9	6.1	6.0	5.9
Carcass bones yield, %	17.1	16.9	17.1	16.7
Cartilage and tendons of the carcass, %	2.3	1.9	2.0	1.8
Fleshing index	4.38	4.40	4.78	4.82

In beef cattle breeding, in the production of beef in the farms of the Southern Federal District (SFD), industrial and stalled-pasture production technologies are used. During the third stage of our research, a comparative analysis of the influence of intensive technology with elements of innovation on animals of the Kalmyk, Hereford and Aberdeen-Angus breeds in conditions of intensive completion of growing was carried out. In the SFD traditional stalled-pasture system, moderate feeding is used, providing the growth energy of young animals at the level of 700–750 g of daily gain and the attainment of slaughter conditions with the live weight of 410–430 kg at 20 months of age.

To enhance the growth energy and increase the pre-slaughter live weight, we carried out intensive completion of growing of young stock from 8-10 months of age in the industrial complex with plenty of coarse and concentrated feed. In order to identify the responsiveness of bull-calves obtained from animals of the factory lines of the Kalmyk breed, for the intensification of growing from 9 months of age, we conducted a comparative assessment of their meat productivity compared with mates of Aberdeen-Angus and Hereford breeds in the industrial complex (table 11).

Table 11 – Dynamics of live weight of bull-calves for 273 days of completion pf growing, (n =23)

Indicator	Breed		
	Aberdeen-Angus	Hereford	Kalmyk
When setting on the experiment, kg	251.5*± 4.7	248.1± 5.2	240.2± 6.0
When withdrawing from the experiment, kg	668.2**±6.4	661.8**±5.1	625.4±6.6
Absolute gain, kg	416.7**	413.7**	385.2
Average daily gain, g	1526**	1515**	1411
*P ≤ 0.05, **P ≤ 0.01.			

Experimental groups were formed taking into account the average group breed indicators of live weight, established earlier for a number of years. Therefore, when setting on the experiment, 9-month-old Kalmyk calves were inferior in live weight to their mates from other groups by 4.7... 3.3%. During the 9-month intensive completion of growth, the average daily gain was 105-115 g lower than that of their mates of Aberdeen-Angus and Hereford breeds. So, as a result, for the period of the experiment, in the group of Kalmyk bull-calves, the absolute gain was less on 31 kg. The pre-slaughter live weight was also significantly lower (table 12).

Table 12 – Indicators of slaughter of bull-calves at the age of 18 months (n =5)

Indicators	Breed		
	Aberdeen-Angus	Hereford	Kalmyk
Pre-slaughter live weight, kg	648.0±5.2	641.3±5.0	606.6±3.7
Hotcarcassweight, kg	384.97±1.3	380.54±1.3	361.05±1.3
Hotcarcassweight, %	59.41	59.34	59.52
Mass of internal tallow, kg	21.9±0.7	20.7±1.0	19.1±0.8
Mass of internal tallow, %	3.38	3.23	3.15
Slaughterweight, кг	406.87±1.2	401.24±1.6	380.15±1.4
Slaughteryield, %	62.79	62.56	62.67
Muscle tissue yield, %	75.9	75.4	75.7
Fat tissue yield, %	5.9	5.3	5.7
Bones yield, %	16.0	17.0	16.2
Fleshing index	4.74	4.43	4.88
The ratio of edible to inedible part of the carcass	4.49	4.18	4.38

It should be noted that at the age of 18 months, bull-calves of the Kalmyk breed had a pre-slaughter live weight of 606 kg and hot carcass weight of 3161 kg, which were only 19 and 23 kg less than that of imported mates. At the same time, the slaughter yield, the yield of fat tissue, the fleshing index and the ratio of edible to inedible parts of the carcass were slightly higher than that of the Hereford bulls.

When analyzing the physico-chemical parameters of muscle tissue, it was noted that in the subscapularis and the longissimus muscle of the Kalmyk bull-calves, the content of the protein mass fraction was slightly higher. In the muscle flesh of the bull-calves of the new factory lines moisture-binding capacity was 3–13% higher and, almost as much, lower juice loss during cooking (table 13).

Table 13 – Physico-chemical indicators of the subscapularis (1) and the longissimus muscle (2) in the bull-calves of the experimental groups

Indicators	Breed (n = 5)					
	Aberdeen-Angus		Hereford		Kalmyk	
	1	2	1	2	1	2
pH	5.67	5.56	5.61	5.61	5.67	5.97
Moisturecontent, %	73.50	75.46	71.53	75.14	75.62	75.19
Proteinmassfraction, %	17.05	16.7	21.0	16.20	19.0	17.4
Fatmassfraction, %	8.57	6.95	6.67	7.66	4.40	6.51
Moisture binding capacity, % to the meat	46.54	47.87	57.29	56.83	52.44	60.04
Juice loss during cooking, %	31.38	30.92	24.71	20.06	20.30	21.95

This testifies to the superiority of the nutritional value of the muscle tissue of the bull-calves of the Kalmyk breed in comparison with the mates of the Aberdeen-Angus and Hereford breeds. The similar pattern was manifested in the content of total amino acids in the longest back muscle (table 14). In Aberdeen-Angus and Hereford bull-calves, the longissimus muscle contains less aspartic and glutamic acids, which play an important role in nitrogen metabolism.They improve the metabolism of cells of the nervous system, regulate the synthesis of testosterone, transforming the functional status of the endocrine and nervous systems, contribute to the neutralization and evacuation of ammonia from the body. Perhaps that is why Kalmyk bull-calves are more mobile and eat better coarse feed.

In the longest back muscle of the Kalmyk bull-calves, there are some more essential amino acids such as valine, isoleucine, leucine, and lysine, as well as the nonessential ones - arginine, alanine, tyrosine, and proline. Their molecules in the human body become a substrate for the synthesis of adrenaline, norepine-

Table 14 – Common amino acids of the longissimus muscle of bull-calves (g/100 g of product)

Amino acids	Breed (n = 3)		
	Aberdeen-Angus	Hereford	Kalmyk
Asparticacid	1.35±0.04	1.47±0.04	1.50±0.04
Glutamicacid	1.93±0.06	1.86±0.06	2.02±0.06
Serine	0.90±0.03	0.83±0.02	0.89±0.03
Histidine	0.71±0.02	0.68±0.02	0.67±0.02
Glycine	1.00±0.03	0.94±0.03	1.00±0.03
Threonine	0.85±0.03	0.81±0.02	0.83±0.02
Arginine	1.24±0.04	1.16±0.03	1.32±0.04
Alanine	1.02±0.03	0.99±0.03	1.07±0.03
Tyrosine	0.45±0.01	0.44±0.01	0.56±0.02
Cystine	0.29±0.01	0.29±0.01	0.29±0.01
Valine	0.89±0.03	0.88±0.03	1.02±0.03
Methionine	0.34±0.01	0.37±0.01	0.23±0.01
Phenylalanine	0.68±0.02	0.60±0.02	0.64±0.02
Isoleucine	1.15±0.03	1.10±0.03	1.21±0.04
Leucine	1.23±0.04	1.18±0.04	1.28±0.04
Lysine	1.62±0.05	1.55±0.05	1.73±0.05
Proline	0.95±0.03	0.94±0.03	1.04±0.03
Total	16.59±0.50	16.09±0.48	17.27±0.52

phrine, histamine, they are part of the body's structural and enzyme proteins, regulate gastric secretion, participate in immune reactions, synthesize hemoglobin, and form its proteinaceous portions designed to keep the iron atoms in the whole substance. A higher content of these amino acids improves the quality of muscle tissue, as a food product for people.

Some essential amino acids (valine, isoleucine, leucine) stimulate the activity and performance of human mental activity, improve the functional properties of the central nervous system, neuromuscular communication and the human mental state, and in conditions of lack of energy, these amino acids can be used as its source. They respond for the restoration of muscle and bone tissue, and lysine affects the rate of synthesis of muscle and conjunctive organic tissues; accelerates the accumulation of calcium in the body and, stimulating the ATP extraction of from glycogen molecules, regulates energy exchange.

Consequently, the muscular tissue of the bull-calves of the Kalmyk breed, used as a food product, will provide to a large extent the vital functions in the human body with the necessary amino acids.

Conclusions:

1. The genetic resources of cattle of the newly created Rostov type of Kalmyk breed are quite diverse and are characterized by higher productivity indicators. The average live weight of adult servicing bulls in the initial population is about 868 kg, of cows - 515 kg, and in the new factory lines - 873 and 528, that exceeds the elite-record class minimum requirements by 13 and 8 kg (1.5%), respectively.

2. Of three genealogical groups and eight genealogical lines that are common in the Kalmyk breed, the most desirable for breeding to increase meat productivity are animals of the factory lines of Pirat 6626, Pokhvalniy 8643, Ozhog 6136 and the genealogical line of Manezh 7113. According to the exterior assessment and live weight, cows of these lines exceed the peers of other lines in milking capacity and the average indicators of these traits in the population by 9.2 - 11.8%.

3. On the basis of the electronic database created with our participation and the BRBCB software module, the selective-genetic indicators of meat productivity were evaluated for the entire analyzed population. The inheritance and correlation coefficients were determined. The technique of their use in breeding when creating a Rostov-type Kalmyk breed was proposed. The impact of live weight of cows on their milking capacity and live weight of offspring has been established and there was no direct relation-

ship between the indicators of height at hips of cows and the live weight of their offspring. Therefore, the selection on this basis will not work towards the necessary rate of increase in milking capacity of cows and the growth energy of young animals, even against the background of high values of heritability coefficients and a positive correlation between these traits.

4. In assessing the genotype of more than 80 servicing bulls according to the phenotype of their sons and daughters, it was found that only 47% of fathers pass on their high qualities to descendants of both sexes. About 40% of servicing bulls are improvers only for their sons, and only 20% are daughters' improvers. More than 50% of bulls, which, when assessed in the quality of the offspring according to the current instructions, have the category of "improver", are not desirable for use in breeding work. The computer technology for assessment of bulls in the quality of offspring according to the selection index proposed by us increases by 2-3 times the efficiency of identifying bulls-improvers, which descendants have a long body type and at 15 months of age exceed in live weight not only mates from neutral bulls by 20-60 kg, but also the elite-record class requirements.

5. With the intensive growing of 9-month-old bulls of factory lines of the Kalmyk breed and mates of the Aberdeen-Angus and Hereford breeds in the conditions of the industrial complex at full feeding with coarse and concentrated feed, live weight at 18 months of age was 625.4; 668.2 and 661.8 kg, respectively. For the 9-month period of growing, in absolute gain, Kalmyk bull-calves (385.2 kg) were inferior to imported mates (416.7 and 413.7 kg) by 28–31 kg. In slaughter yield, fat tissue yield, fleshing index and the ratio of edible to inedible parts of carcass, Kalmyk bull=calves were somewhat superior to Hereford breed animals.

6. According to the analysis of physico-chemical parameters of muscle tissue, it was noted that in the subscapularis and the longissimus muscles of the Kalmyk calves, the level of the content of the protein mass fraction was slightly higher than that of the Aberdeen-Angus and Herford mates. Their moisture binding capacity was 3–13% higher and almost as much lower in the juice loss during cooking. The protein of the Kalmyk breed animals had a slightly higher level of such essential amino acids asvaline, isoleucine, leucine, and lysine, as well as the nonessential ones - arginine, alanine, tyrosine, and proline. This indicates a higher nutritional value of their muscle tissue than in the mate of the Aberdeen-Angus and Hereford breeds.

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ҚАЛМАҚ ТҰҚЫМЫНЫҢ ІРІ ҚАРА МАЛЫНЫҢ ӨНІМДІЛІГІ МЕН АСЫЛ ТҰҚЫМДЫЛЫҒЫН АРТТЫРУ

Аннотация. Мақалада негізгі биологиялық және өнімділік ерекшеліктері бойынша Қалмақ тұқымдас Ростов ірі қара малының өсірілу жұмысы жағдайы зерттеледі; әр түрлі өндіріс жүйелерінде малдың экономикалық және селекциялық қасиеттерін зерттеді. Зерттеу барысында әртүрлі күту технологиялары бар жаңадан құрылған зауыт линияларының ет өнімділігін қалыптастыру көрсеткіштері анықталды. Еркекпен ұрғашылардың фенотипіне генетика өндірісінің генотипін индексациялау, сондай-ақ сүт және төлді бөлу кезеңдерде өсудің пайда болуына және қарқындылығына байланысты жаңа, калмықтың ірі қара малының өнімділік қасиеттерінің көрінісіне жаңа деректер алынды.

Зерттеу нәтижелері мал шаруашылығының отандық мал шаруашылығын жетілдіру мақсатында зоотехникалық ғылымға белгілі бір үлес қосатын маңызды теориялық негіздеме болып табылады және ауыр тұтас ет пен жоғары сапалы сиыр еті өндірісінде практикалық жұмыстарда пайдаланылуы мүмкін. Бұл нарықтық экономикадағы саланың тиімділігін арттырады және тұқымның өндірістік әлеуетін толық пайдалануды қамтамасыз етеді.

Түйін сөздер: қалмақ тұқымы, тұқым ішкі тип, селекциялық индексі, генеалогиялық құрылымы, өсу, ет өнімділігі, амин қышқылының құрамы.

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СОВЕРШЕНСТВОВАНИЕ ПЛЕМЕННЫХ И ПРОДУКТИВНЫХ КАЧЕСТВ СКОТА КАЛМЫЦКОЙ ПОРОДЫ

Аннотация. В статье проанализировано состояние работы создаваемого ростовского типа крупного рогатого скотакалмыцкой породы по основным биолого-продуктивным особенностям; изучены хозяйственно-полезные и племенные качества скота при различных системах производства. В ходе исследований установлены показатели формирования мясной продуктивности вновь созданных заводских линий при разных технологиях содержания. Получены новые данные по индексной оценке генотипа быков-производителей по фенотипу сыновей и дочерей, а так же по проявлению продуктивных качеств молодняка, нового типа скота калмыцкой породы, в зависимости от происхождения и интенсивности выращивания в молочный и постотъемный периоды.

Результаты исследований служат важным теоретическим обоснованием, вносящим определенный вклад в зоотехническую науку, с целью совершенствования отечественного скота мясного направления продуктивности и могут быть использованы в практической работе при производстве тяжеловесных туш и высококачественной говядины. Это повысит эффективность ведения отрасли в условиях рыночной экономики и обеспечит более полное использование продуктивного потенциала породы.

Ключевые слова: калмыцкая порода, внутрипородный тип, селекционный индекс, генеалогическая структура, рост, мясная продуктивность, аминокислотный состав.

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