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The Level of Breeding Value of Cattle of the Auliekol Breed, Calculated by the Blup Method

[1]Anuarbek Temirbekovich Bissembayev, [2]Alzhan Smailuly Shamshidin, [1]Zhanat Maratovich Kasenov, [3]Nurgali Risspayevich Bissekenov, [1]Askhat Erbosynovich Chindaliyev, [4]Yusupzhan Artykovich Yuldashbayev and [1]Dastanbek Asylbekovich Baimukanov

[1]Department of Animal Husbandry, Veterinary Medicine and Feed and Milk Quality Assessment, Scientific and Production Center for Animal Husbandry and Veterinary, Astana, Kazakhstan
[2]Zhangir Khan Agrarian Technical University, Uralsk, Kazakhstan
[3]Auliekol Beef Cattle Breed Association, Nur-Sultan, Kazakhstan
[4]Institute of Animal Science and Biology, Russian State Agrarian University - Moscow Timiryazev Agricultural Academy, Moscow, Russia

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Corresponding Author:
Askhat Erbosynovich Chindaliyev
Department of Animal Husbandry, Veterinary Medicine and Feed and Milk Quality Assessment, Scientific and Production Center for Animal Husbandry and Veterinary, Astana, Kazakhstan
Email: askhat.chindaliev@gmail.com

Abstract: Currently, the assessment of the breeding value of livestock provides for new approaches to determine the genetic qualities of animals that sustainably transmit to offspring. This is achieved by using the phenotypic data of the ancestors, the closest lateral relatives, as well as the animals themselves and their descendants, which, according to all canons, is facilitated by the so-called BLUP methodology. The purpose of the study is to establish the estimated breeding values of Auliekol cattle by productive indicators. For the Auliekol cattle breed, the estimated breeding values in terms of live weight at birth varied in the range: The first year from -3.47 to ++9.03; the second year -5.18 to +12.60; the third year -5.22 to +12.52; in 2021-5.18 to +12.52. The percentile distribution of the calculated EBV of the live weight of the Auliekol cattle breed at weaning in 2018 varied in the range from -19.76 to +53.63, in 2019-23.88 to +63.65, in 2020 -24.33 to +63.01, in 2021 -23.58 to +62.53. The EBV in terms of live weight at one year of age in 2018 varied from -39.37 to +71.86, in 2019 -34.44 to +90.83, in 2020 -33.34 to +90.24, in 2021 -34.21 to +90.81. The estimated breeding value in terms of live weight for adult animals in 2018 ranged from -43.11 to +57.72, in 2019 -97.40 to +105.45, in 2020 -95.57 to +106.99, in 2021 -176.40 to +110.53. The EBV for the indicator of the milking capacity of mothers of the Auliekol breed in 2018 ranged widely from -28.89 to +65.89, in 2019 -26.18 to +52.71, in 2020 -24.01 to +51.55, in 2021 -23.67 to +52.75. For the Auliekol cattle breed, the EBV in terms of the average daily gain from birth to 12 months of age is in the range of the minimum indicator from -198.29 to -242.68, the maximum indicator from +235.88 to +348.71.

Keywords: Beef Cattle, Auliekol Breed, Live Weight, Estimated Breeding Value (EBV)

Introduction

Increasing the production of high-quality beef is one of the most important and difficult tasks of agrarian science and practice, resolving which requires increased efficiency of using available breeding resources of beef cattle. The relevance of increasing meat production in the shortest possible time and therefore intensification of specialized meat cattle breeding is dictated by the need to expand the meat export potential of the country in order to ensure its food safety. Meat cattle breeding in Kazakhstan is based mainly on breeding the animals of the Kazakh white-headed breed; thus, its improvement largely depends on

the volume of high-quality beef production (Nassambaev *et al*., 2018).

For Kazakhstan, the Auliekol breed is of particular interest in the development of domestic beef cattle breeding.

The aim of breeding work in cattle breeding, in particular when breeding Auliekol cattle, is to change the genetic fund of animals and improve their traits.

The Auliekol breed of cattle was bred in 1992 in the Kostanay region of the Republic of Kazakhstan by a complex, reproductive crossing of three meat breeds, such as the Aberdeen Angus, Sharolese and Kazakh white-headed breeds, which differed in characteristics such as precocity, large body weight, and ease of calving.

The means of changing the gene pool is selection, which uses productivity as the main indicator for changing this trait at the genetic level (Spanov *et al*., 2019).

The breeding value of livestock is one of the links in the implementation of the breeding program in herd populations to form targeted hereditary traits in animals and select desirable individuals when determining the breeding value of bulls (Spanov *et al*., 2019).

In this regard, the improvement and application of modern methods for evaluating bulls, taking into account the increase in the share of high-productive beef cattle in Kazakhstan, is an acute issue for science and practice (Kuliev *et al*., 2020).

In the Republic of Kazakhstan, selection and breeding work is aimed at breeding animals with specified zootechnical parameters, adapted to modern technology (Oraz *et al*., 2022).

The main factor in the manifestation of the genetic potential of the meat productivity of cattle is rational feeding rates that affect the metabolism, namely, the average daily gain (Musaeva *et al*., 2020).

In the beef cattle breeding of Kazakhstan, the Kazakh white-headed breed has been well-studied in the breeding plan (Bozymov *et al*., 2019).

The need for increased production of high-quality beef is primarily dictated by the requirements of the external market. In this aspect, improving the genetic processes in the population extends the real possibility of intensifying the breeding process and allows the development of new science-based programs for improving the stud and productive qualities of meat animals. In improving cattle of the Kazakh white-headed breed, the main method of improving the hereditary qualities today is purebred breeding by stud lines. The importance of the method of breeding by lines is in the fact that it allows fast fixation and development of the desired traits, which are characteristic of individual animals, in many descendants. This requirement primarily arises when a new breed or a new stud type of cattle appears (Nassambaev *et al*., 2018).

The knowledge of genotypic processes occurring in populations broadens the real possibility of intensifying the selection process and allows the development of new, scientifically-based programs to improve the breeding and productive qualities of beef cattle. Nowadays, molecular genetic methods of analysis are used to establish the origin of breeding animals (Nugmanova *et al*., 2020).

At this stage, the evaluation of animals by the BLUP method becomes more important, the effectiveness of which indicates the level of their breeding value by phenotypic indicators and the distribution of their degree of genetic potential.

Currently, in the Republic of Kazakhstan, the calculation of the breeding value of cattle of the Auliekol breed by the method of indices has not been carried out. Thus, all of the above determined the relevance of the research.

The Aim of the Research

This is to establish the estimated breeding values of the Auliekol cattle breed according to productive indicators.

Materials and Methods

The research was carried out at the population level of Auliekol breeding cattle bred in the Republic of Kazakhstan. Formation of data for analysis, the materials of the "republican livestock system" database of the information and analytical system were used.

Assessment of genetic qualities-an index assessment of the genetic breeding value of beef cattle was carried out using the method of the best linear unbiased prediction-BLUP.

For this, mixed linear biometric Animal Models (AM/MME) were built for each estimated productive trait: Live weight at birth, live weight at weaning, the milking capacity of cows at weaning of the calf, and live weight at one year of age. These models took into account the contributions of many factors and effects to the estimated productive trait: Fixed and genetic effects, environmental factors, seasonal factors, and random and unaccounted effects. The influence of all factors included in the model was taken into account simultaneously in the course of calculations.

The BLUP method was carried out based on data on productivity and zootechnical events of breeding cattle of beef breeds from farms registered in the Database of the Information Analytical System (DB-IAS). Initial indicators of the productivity of cattle of the studied breed for evaluation by the BLUP method: Live weight at birth, live weight at weaning and live weight at one year of age. Fixed effects of influence took into account: Differences in the content of individuals on farms; years and seasons of calving; sex and age group of calves; mother's age; type of birth (single, twin).

The biometric model of the animal considered additive genetic effects due to parental qualities in generations taken

up to three ancestors, the sex of the animal, the effects of the herd, and the effects of the year and season of birth (Abdelmanova *et al*., 2021; Nikonova *et al*., 2021).

The recommendations of the international non-governmental non-profit organization FAO regarding the assessment of the breeding value of livestock have been studied (Henderson, 1975).

When evaluating servicing bulls, statistical approaches and methods are mainly used: Assessment of the genetic breeding value of an animal according to a mixed biometric model Animal Model/Mixed Model Equation (AM/MME) using the classical method of the Best Linear Unbiased Prediction (BLUP).

The initial indicators of the live weight of young animals at birth, and at weaning were adjusted in accordance with the age of the mothers, which affect the studied indicators. Table 1 shows adjusted values for live weights at birth and weaning.

Similarly, live weight at weaning was adjusted to 210 days of age and body weight per year by 365 days of age. Initial data adjustments were made according to formulas (1-3):

$$CMp = Mp + \Phi Mp \quad (1)$$

$$CMo = \frac{Mo - Mp}{B_M} \times 210 + \Phi Mo + CMp \quad (2)$$

$$CM_{\Gamma} = \frac{Mr - Mo}{Br - B_M} \times 155 + CMo \quad (3)$$

where:

CMp = Adjusted live weight at birth, kg
Mp = Live weight at birth, kg
ΦMp = Adjusted live weight at birth, taking into account the age of the mother, kg
CMo = Adjusted live weight at weaning, kg
Mo = Live weight at weaning, kg
B_M = Animal age when weighed at the time of weaning, days
ΦMo = Correction factor of live weight at weaning by mother's age, kg (Table 1)
CM_{Γ} = Adjusted live weight at one year of age, kg
M_{Γ} = Live weight at one year of age, kg
B_{Γ} = Animal age when weighed at one-year-old, days

The Estimated Breeding Value (EBV) of the productive indicators of animals of the Auliekol breed was determined for 2018-2022. The index values were further interpreted as an assessment of the own genetic productivity of each evaluated animal relative to the corresponding average values.

Auliekol cattle are characterized by a harmonious and proportional physique and a strong and dense constitution. The suit is predominantly light and ashy (gray) in different shades. The lumpy head is short with a broad forehead. The upper line (back and loin) is straight and wide, the backbone is of medium massiveness, and a well-developed posterior third of the trunk with sufficient muscularity contributes to a higher yield of valuable cuts in the carcass. Strong and upright limbs have an average length, and the udder is rounded and full. The absence of horns and a calm disposition ensure good adaptability of animals of the new genotype and contribute to its suitability for the technology of loose keeping in large groups with the mechanization of the main production processes for the care of livestock, which increases labor productivity in the industry. Bulls-producers of the Auliekol breed at the age of 5 years and older reach a live weight of 950-1050 kg, which is 15-28% higher than the breed standard (class I) in Kazakh white-headed bulls (820 kg). The live weight of full-aged cows of the Auliekol breed is 500-600 kg, which exceeds the indicators of the Kazakh white-headed breed in the best breeding farms by 4-6% and in some years the superiority reaches 19% and higher. Auliekol cows are characterized by good maternal qualities and high milk production (live weight of a calf at 205 days of age), which exceeds the standard (class I) of the Kazakh white-headed breed by 12.3%.

Auliekol cows have sufficiently high reproductive qualities, which ensures the yield of calves in the range of 90-97 calves per 100 queens. Heifers are mostly inseminated at 17-20 months. At the same time, calving in first born heifers and cows takes place without childbirth.

Table 1: Adjusted values for indicators of live weights of the calf, taking into account the age of the mother

		Correction for live weight at weaning, kg	
Mother's age	Correction for live weight at birth, kg	Bull	Heifer
2 years	+3.1	+33	+27.0
3 years	+1.3	+17	+14.0
4 years	+0.4	+7	+4.5
5-10 years	0.0	0	0.0
11 years and older	+0.9	+12	+11.0

Results

One of the ways to effectively improve the breeding and productive qualities of the Auliekol breed of beef cattle is to determine the genetic value of breeding bulls, selection, on this basis, the best, and their widespread use in breeding and commodity herds. The theoretical basis for the selection of the Auliekol breed of beef cattle in terms of growth intensity is population genetics, which allowed us to identify sufficiently high: Genetic variability, the heritability of this trait, and the correlation between the growth rate at a young age of the producer bull itself and its descendants.

Highly productive European breeds of cattle are widely used in various natural and climatic zones. Animals are brought into areas with similar climates and environmental conditions that are more or less different from the climate where the imported breed was formed. Animals are forced to adapt to new conditions of existence. The main natural and climatic factors acting on the body are air temperature, humidity, atmospheric pressure, etc. Mostly, these factors act in the form of a complex, but some become dominant in certain conditions (Kayumov *et al*., 2021).

Based on the research results, a methodology was developed for calculating the index score using the BLUP AM statistical method with the construction of a genetic model of the animal, and predicted breeding values were calculated for 5 productive indicators: Live weight at birth, at weaning, and at 12 months. age, at the age of 5 years, the milking capacity of cows.

For the Auliekol cattle breed, the estimated breeding values in terms of live weight at birth varied in the range: The first year from -3.47 to +9.03; the second year from -5.18 to +12.60; the third year -5.22 to +12.52; in 2021 -5.18 to +12.52 (Table 2).

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. In the second stage of the research, in the course of the breeding experiment using a common database 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 (Asylbekovich *et al*., 2019). The distribution by percentiles of the calculated EBV values of the live weight of animals of the Auliekol breed at weaning in 2018 varied in the range from -19.76 to +53.63, in 2019 -23.88 to +63.65, in 2020 -24.33 to +63.01, in 2021 -23.58 to +62.53 (Table 3).

The EBV in terms of live weight at one year of age in 2018 was -39.37 to +71.86, in 2019 -34.44 to +90.83, in 2020 -33.34 to +90.24, in 2021 -34.21 to +90.81 (Table 4).

The EBV in terms of live weight for adult animals in 2018 ranged from -43.11 to +57.72, in 2019 -97.40 to +105.45, in 2020 -95.57 to +106.99, in 2021 -176.40 to +110.53 (Table 5).

The estimated breeding value in terms of the milking capacity of mothers of the Auliekol breed in 2018 fluctuated widely from -28.89 to +65.89, in 2019 -26.18 to +52.71, in 2020 -24.01 to +51.55, in 2021 -23.67 to +52.75 (Table 6).

Currently, there is a need to study the dynamics of spermatological indicators of the semen of stud bulls and to determine the importance of stud bulls' origin within each breed, as well as to study the possibility of predicting their sperm productivity (Nassambaev *et al*., 2019).

In the process of calculating the EBV of animals of the Auliekol breed in 2021-2022, their accuracies were obtained (Table 7).

For the Auliekol cattle breed, the values of the calculated EBVs in terms of average daily gain from birth to 12 months of age lie in the range for the minimum indicator from -198.29 to -242.68, for the maximum indicator from +235.88 to +348.71 (Table 8).

Table 9 shows the values of the breeding value indices for three indicators (live weight at birth, at weaning, and at 12 months of age) for 10 heads of bulls and 10 heads of heifers of the Auliekol breed.

It was found that bulls significantly outperform heifers in live weight at birth, at weaning, and at one-year-old age.

At birth, bulls have a live weight of 24-30 kg, at weaning 207-235 kg, and at one-year-old age 35-335 kg. In heifers, the live weight was 22-24 kg at birth, 185-210 kg at weaning, and 255-280 kg at one-year-old age.

The breeding value index was -0.62 and 2.46 for live weight at birth in bulls, and -1.26 and 1.63 for heifers.

The breeding value index was -3.33 and 4.40 for weaning in bulls, and -1.86 and 2.42 for heifers.

At one year of age, the breeding value index was, respectively: Bulls -3.79 and 18.78; heifers 4.30 and 11.65.

The live weight of bulls and heifers at birth, at weaning, at one-year-old age, as well as in adult animals aged 5 years and older were analyzed (Table 10). It was found that the live weight of bulls was 27.3 kg at birth, 209.4 kg at weaning, 317.7 kg at one-year-old age, and 779.5 kg at 5 years and older. Heifers have an average live weight of 25.2 kg at birth, 191.0 kg at weaning, 278.2 kg at one year of age, and 549.8 kg at 5 years of age.

Table 2: Percentile distribution of calculated EBV of live weight of Auliekol breed at birth

	Year of observation				
Percentile %	2018	2019	2020	2021	2022
0	-3.47	-5.18	-5.22	-5.18	-5.06
5	-0.70	-0.77	-0.81	-0.77	-0.74
10	-0.45	-0.42	-0.45	-0.42	-0.40
20	-0.18	-0.09	-0.11	-0.09	-0.07
25	-0.10	+0.00	-0.00	-0.00	0.00
30	-0.04	+0.00	0.00	0.00	+0.01
40	+0.02	+0.00	0.00	0.00	+0.21
50	+0.14	+0.08	+0.07	+0.13	+0.43
60	+0.27	+0.28	+0.27	+0.34	+0.67
70	+0.43	+0.50	+0.50	+0.57	+0.95
75	+0.53	+0.63	-0.00	-0.00	+1.35
80	+0.64	+0.77	+0.78	+0.85	+1.71
90	+0.98	+1.19	+1.20	+1.27	+12.73
95	+1.29	+1.57	+1.59	+1.67	-5.06
100	+9.03	+12.60	+12.52	+12.52	+12.73
Minimum	-3.47	-5.18	-5.22	-5.18	-5.06
Maximum	+9.03	+12.60	+12.52	+12.52	-0.74

Table 3: Percentile distribution of calculated EBV values of live weight of Auliekol cattle breed at weaning

	Year of observation				
Percentile %	2018	2019	2020	2021	2022
0	+53.63	+63.65	+63.0100	+62.53	+65.71
5	+6.56	+6.24	+6.0100	+6.95	+7.37
10	+5.19	+4.88	+4.6400	+5.44	+5.93
20	+3.74	+3.36	+3.0800	+3.80	+4.39
25	+3.23	+2.78	-	-	+3.28
30	+2.80	+2.29	+2.0000	+2.64	+2.34
40	+2.02	+1.45	+1.1600	+1.70	+1.47
50	+1.34	+0.63	+0.4000	+0.82	+0.56
60	+0.68	+0.00	0.0000	+0.07	0.00
70	+0.10	+0.00	-0.0001	0.00	0.00
75	+0.00	+0.00	-	-	-0.56
80	-0.11	+0.00	-0.1300	-0.01	-1.66
90	-0.91	-0.73	-1.0700	-0.87	-24.42
95	-1.79	-1.64	-2.0700	-1.97	-24.42
100	-19.76	-23.88	-24.3000	-23.58	+65.71
Minimum	-19.76	-23.88	-24.3000	-23.58	+65.71
Maximum	+53.63	+63.65	+63.0100	+62.53	+7.37

Table 4: Percentile distribution of calculated EBV values of live weight of animals of the Auliekol breed at one year of age

	Year of observation				
Percentile %	2018	2019	2020	2021	2022
0	+71.86	+90.83	+90.240	+90.81	+96.10
5	+15.27	+15.05	+14.170	+15.00	+16.26
10	+12.82	+12.80	+11.960	+12.80	+14.06
20	+10.01	+10.11	+9.430	+10.24	+11.43
25	+8.98	+9.06	-0.000	-0.00	+9.49
30	+8.06	+8.10	+7.580	+8.31	+7.76
40	+6.50	+6.34	+5.880	+6.57	+6.04
50	+5.07	+4.58	+4.200	+4.90	+4.13
60	+3.62	+2.43	+2.140	+2.90	+1.54
70	+1.96	+0.08	+0.050	+0.40	0.00
75	+1.05	+0.00	-0.000	-0.00	0.00
80	+0.23	+0.00	0.000	0.00	-0.53
90	-0.40	+0.00	-0.001	-0.00	-34.01
95	-1.71	-0.67	-0.930	-0.70	-34.01
100	-39.37	-34.44	-33.340	-34.21	+96.10
Minimum	-39.37	-34.44	-33.340	-34.21	+96.10
Maximum	+71.86	+90.83	+90.240	+90.81	+16.26

Table 5: Percentile distribution of calculated EBV values of live weight of Auliekol breed animals aged 5 years and older

	Year of observation				
Percentile %	2018	2019	2020	2021	2022
0	+57.72	+105.45	+106.990	+110.53	+114.21
5	+22.51	+11.34	+12.760	+14.53	+16.23
10	+7.57	+7.57	+8.930	+10.17	+11.60
20	+2.35	+3.92	+5.160	+5.76	+7.07
25	+1.70	+2.73	-0.000	-0.00	+4.25
30	+0.96	+1.70	+2.770	+3.10	+2.10
40	+0.00	+0.15	+0.850	+1.05	+0.31
50	-0.40	+0.00	0.000	0.00	0.00
60	-1.35	+0.00	-0.001	0.00	-0.17
70	-2.89	-1.03	-0.400	-0.47	-2.14
75	-3.74	-2.04	-0.000	-0.00	-5.89
80	-4.75	-3.31	-2.420	-2.69	-9.49
90	-10.30	-7.16	-6.140	-6.59	-177.94
95	-14.87	-11.10	-10.020	-10.41	-177.94
100	-43.11	-97.40	-95.570	-176.40	+114.21
Minimum	-43.11	-97.40	-95.570	-176.40	+114.21
Maximum	+57.72	+105.45	+106.990	+110.53	+16.23

Table 6: Percentile distribution of calculated EBV values of the milking capacity of Auliekol breed mothers

	Year of observation				
Percentile %	2018	2019	2020	2021	2022
0	+65.89	+52.71	+51.550	+52.75	+51.44
5	+5.61	+4.86	+5.430	+6.31	+6.53
10	+4.08	+3.33	+3.820	+4.67	+5.02
20	+2.38	+1.69	+2.150	+2.82	+3.37
25	+1.81	+1.13	-0.000	-0.00	+2.22
30	+1.34	+0.68	+1.090	+1.64	+1.28
40	+0.57	+0.00	+0.270	+0.72	+0.43
50	+0.00	+0.00	0.000	0.00	0.00
60	-0.35	+0.00	-0.001	0.00	0.00
70	-1.04	-0.64	-0.320	-0.06	-0.60
75	-1.46	-1.05	-0.000	-0.00	-1.94
80	-1.95	-1.52	-1.140	-0.87	-3.27
90	-3.37	-2.88	-2.450	-2.25	-27.43
95	-4.74	-4.08	-3.630	-3.60	-27.43
100	-28.89	-26.18	-24.010	-23.67	+51.44
Minimum	-28.89	-26.18	-24.010	-23.67	+51.44
Maximum	+65.89	+52.71	+51.550	+52.75	+6.53

Table 7: Percentile distribution of calculated accuracy for EBV of productive indicators of Auliekol breed animals, according to 2021-2022 data

	Accuracy of EBV of live weight, kg				
Percentile %	At birth	At weaning	At the age of 12 months	Accuracy of EBV of dairy cows	Accuracy of the EBV of an adult animal
The 2021 year					
0	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
20	0.009	0.002	0.003	0.004	0.002
30	0.155	0.095	0.114	0.117	0.090
40	0.303	0.209	0.220	0.183	0.170
50	0.464	0.264	0.272	0.215	0.209
60	0.505	0.292	0.318	0.247	0.233
70	0.524	0.311	0.356	0.288	0.253
80	0.534	0.329	0.378	0.367	0.274
90	0.577	0.351	0.404	0.522	0.311
95	0.614	0.373	0.429	0.618	0.348
100	0.996	0.985	0.987	0.986	0.954

Table 7: Continue

The 2022 year					
0	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
20	0.024	0.010	0.013	0.023	0.009
30	0.228	0.159	0.171	0.148	0.133
40	0.390	0.242	0.240	0.194	0.183
50	0.481	0.283	0.283	0.226	0.215
60	0.518	0.305	0.326	0.263	0.240
70	0.529	0.322	0.364	0.302	0.259
80	0.540	0.339	0.385	0.363	0.281
90	0.586	0.362	0.410	0.534	0.320
90	0.586	0.362	0.410	0.534	0.320
100	0.997	0.992	0.994	0.986	0.957

Table 8: Percentile distribution of calculated EBV values of average daily growth of Auliekol breed animals

	EBV, g/day		
Percentile %	SP 0-205	SP 205-12	SP 0-12
0	+235.88	+271.88	+348.73
5	+77.15	+55.23	+101.04
10	+59.90	+39.00	+78.74
20	+41.38	+24.50	+53.15
30	+28.63	+15.89	+36.63
40	+18.56	+9.51	+23.20
50	+9.40	+4.02	+11.65
60	+0.56	-1.39	+0.39
70	-8.76	-7.29	-11.23
80	-19.58	-14.59	-24.94
90	-36.41	-26.18	-44.54
95	-51.44	-37.49	-61.79
100	-198.29	-200.74	-242.68
Minimum	-198.29	-200.74	-242.68
Maximum	+235.88	+271.88	+348.73

Table 9: The results of the index evaluation of the live masses of animals of the Auliekolsky breed based on the results of their own calculations

			Live weight, kg				
No.	Identification number of the animal	Year of birth	At birth	When weaning	Adjusted for 210 days	Per year	Adjusted for 365 days
Bulls							
1	8182898	2019	30	235	194.4	320	317.0
2	8182902	2019	24	230	204.8	315	312.0
3	8182905	2019	26	230	200.8	330	326.9
4	8191605	2019	28	220	186.1	319	316.4
5	8191624	2019	27	216	180.6	316	311.8
6	9340210	2020	25	207	185.1	325	327.5
7	9340211	2020	26	208	186.6	335	337.6
8	9340213	2020	26	211	189.3	318	320.5
9	9340214	2020	25	208	186.6	335	337.6
10	9340216	2020	26	207	182.3	325	324.4
Heifers							
1	9340252	2020	22	200	181.3	270	269.3
2	9340253	2020	23	200	182.8	269	268.6
3	9340254	2020	22	200	181.8	268	263.8
4	9352936	2020	25	210	164.0	265	265.3
5	9353091	2020	25	205	160.7	280	280.4
6	7680637	2019	22	185	177.6	255	252.0
7	7680638	2019	24	195	182.5	265	261.4
8	7680640	2019	24	195	178.1	265	261.4
9	7680641	2019	23	195	175.7	260	256.5
10	7680643	2019	23	190	179.4	260	256.7

Table 9: Continue

No.	Identification number of the animal	Year of birth	Estimation of live weight at birth		Estimation of live weight at weaning		Assessment of live weight at 12 months of age	
			Breeding value index	Accuracy	Breeding value index	Accuracy	index	Accuracy
Bulls								
1	8182898	2019	2,46.00	0.522	4.40	0.299	0.97	0.365
2	8182902	2019	-0.30	0.530	1.80	0.324	-3.79	0.384
3	8182905	2019	0.39	0.523	-0.24	0.303	3.70	0.367
4	8191605	2019	-0.26	0.541	1.23	0.353	5.43	0.398
5	8191624	2019	-0.62	0.542	4.22	0.355	4.68	0.401
6	9340210	2020	-0.23	0.531	-0.72	0.317	17.00	0.365
7	9340211	2020	0.12	0.528	-2.18	0.306	18.78	0.355
8	9340213	2020	-0.22	0.527	-2.48	0.306	15.13	0.355
9	9340214	2020	-0.35	0.529	-2.47	0.309	16.51	0.358
10	9340216	2020	-0.17	0.530	-3.33	0.311	15.51	0.359
Heifers								
1	9340252	2020	-1.26	0.532	-0.86	0.320	4.30	0.373
2	9340253	2020	-0.82	0.532	0.40	0.319	4.85	0.371
3	9340254	2020	-1.17	0.525	-0.84	0.301	7.01	0.358
4	9352936	2020	1.19	0.519	0.42	0.282	8.11	0.337
5	9353091	2020	1.63	0.523	1.19	0.285	11.65	0.338
6	7680637	2019	-0.11	0.517	-0.10	0.332	5.56	0.380
7	7680638	2019	0.95	0.528	2.42	0.339	8.23	0.391
8	7680640	2019	0.42	0.511	2.42	0.283	6.12	0.347
9	7680641	2019	0.15	0.511	2.31	0.283	7.07	0.347
10	7680643	2019	0.67	0.530	1.52	0.341	7.48	0.393

Table 10: Average values of productivity indicators of Auliekol cattle

Age group	Live weight at birth, kg		Live weight at weaning on day 210, kg		Live weight for 365 days, kg		Live weight at 5 years and older, kg	
	n	$\bar{X} \pm S\bar{x}$	n	$\bar{X} \pm S\bar{x}$	n	$\bar{X} \pm S\bar{x}$	n	$\bar{X} \pm S\bar{x}$
Bulls	27 693	27.3±0.02	19 472	209.4±0.15	13 647	317.7±0.22	30	779.5±17.158
Heifers	51 008	25.2±0.01	43 765	191.0±0.09*	33 583	278.2±0.13**	1 151	549.8±1.606***

Note: Here and after* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

The difference in live weight in adult livestock, when comparing bulls and cows, is significant ($p \leq 0.001$).

The practice has shown that the greatest effectiveness in testing bulls is achieved when the conditions for feeding and keeping animals during the testing period are standardized and have not changed for many years. A single test regime allows for obtaining comparable results over a long period of time in a number of animal generations.

Discussion

In the conditions of Kazakhstan, on the basis of the conducted research, the values of the indices of the breeding value of cattle of the Auliekol breed according to the main productive indicators have been established at the population level. The obtained data on the live weight of young animals at birth, and at weaning were adjusted in accordance with the age of the mothers, which affect the studied indicators. Previously, the indices of the breeding value of cattle of the Hereford breed of the Kazakh population were determined using generally accepted research methods. At the same time, it was found that the share distribution of accuracy for the calculated breeding value index in 2021 according to the productive indicators of Hereford breed animals contains zero values for the most part for the indicators of dairy cows (Bissembayev *et al*., 2022). Similar data were obtained by us for the Auliekolsky breed of cattle. Based on the research results, a methodology was developed for calculating the index score using the BLUP AM statistical method with the construction of a genetic model of the animal, and predicted breeding values were calculated for 5 productive indicators: Live weight at birth, at weaning, and at 12 months age, at the age of 5 years, the milking capacity of cows. An increase in the proportion of non-zero accuracy values of the EBV of Auliekol cattle indicates a better filling of the database on productive indicators over the past 5 years (2018-2022). The obtained results provide an opportunity to analyze and rank the studied individuals of the Auliekol cattle breed according to the level of their breeding value of genetic qualities, with a purposeful selection of parental pairs. It is proposed to use the data obtained in the large-scale assessment of cattle of the Auliekol breed of cattle according to the indices of breeding value. When working with herds of the Auliekol breed of beef cattle, a comprehensive assessment of animals is used,

which is possible when a certain age is reached. The use of an assessment based on the indices of breeding value makes it possible to evaluate an animal at an early age. According to the results of the conducted research, it was found that the breeding value of the Auliekol breed of beef cattle in different age periods is manifested differently and this must be taken into account. The established index of breeding value of the Auliekol cattle breed is recommended to be used as an addition to traditional methods of breeding and management of breeding work.

Conclusion

The conducted studies on the evaluation of the breeding value index of cattle of the Auliekol breed allowed for the first time to calculate the breeding value indices: According to the indicators of live weight at birth, at weaning, at 12 months of age and adult livestock; according to the milk productivity of mothers; according to the average daily increase in live weight from birth to 12 months of age. The accuracy is calculated for the index of breeding value of productive indicators of the studied breed of cattle. Based on the conducted research, taking into account the novelty of the results obtained, it is proposed to continue research on the study of cattle of the Auliekol breed, covering the entire available breeding stock. This will increase the reliability of the evaluation of animals according to the indices of breeding value, and minimize the receipt of negative results when conducting breeding and genetic work.

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Author's Contributions

Anuarbek Temirbekovich Bissembayev: Responsible executor, experimental part of the research. Share of implementation and contribution to the preparation of the article 15%.

Alzhan Smailuly Shamshidin: Performer, analysed of experimental data. Share of implementation and contribution to the preparation of the article 15%.

Zhanat Maratovich Kasenov and Askhat Erbosynovich Chindaliyev: Executor share of implementation and contribution to the preparation of the article 15%.

Nurgali Risspayevich Bissekenov: Share of implementation and contribution to the preparation of the article 15%.

Yusupzhan Artykovich Yuldashbayev: Share of implementation and contribution to the preparation of the article 10%.

Dastanbek Asylbekovich Baimukanov: Analysed, and generalization of the obtained data. Share of implementation and contribution to the preparation of the article 15%.

Ethics

When conducting the research work, all the principles of scientific ethics are observed. No conflict of interests.

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