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## Growth and development of crossbred bulls obtained by breed transformation in the northern region of Kazakhstan

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This article presents research materials on studying the efficiency of the breed transformation under the Sybaga Program in the Northern Region of Kazakhstan. Since 2016, commercial farms in the Northern Region of Kazakhstan have been working on accumulation cross-breeding of low productive and outbred breeding stock with purebred servicing bulls of Kazakh White-Head, Hereford, Auliekol and Aberdeen-Angus breeds. By 2018, as a result of accumulation cross-breeding, local offspring of calves of the 2<sup>nd</sup> generation of the Aberdeen-Angus breed was obtained in the Stan farm, Kazakh White-Head breed in the Saltanat farm, Hereford breed in the Tishkov O.V. farm and Auliekol breed in the Beyssen farm. The data on the live weight obtained in the process of studying the growth and development of crossbred bulls in different age periods indicate that the crossbred bulls of the 2<sup>nd</sup> generation of the Kazakh White-Head, Hereford and Auliekol breeds at the age of 6 and 8 months were inferior to the standard of the 1<sup>st</sup> class breed.

**Keywords:** beef farming, Sybaga program, crossbreeding, growth and development of young stock, linear growth, breed transformation.

### INTRODUCTION

Currently, there is an urgent need to open a new line of research related to the modern problem of the production and sale of agricultural products that are harmless to human and animal health. The solution of this task should be provided by the intensification of cattle breeding through the introduction of advanced technologies, a more complete use of the genetic potential of meat productivity of raised cattle breeds, the effective use of home-produced food, in particular, natural pastures and hayfields with optimal consumption of concentrated food. Thus, since Northern Kazakhstan is a resort area, where many sanatoriums, health resorts, tourist bases are concentrated, this necessitates a tighter

consideration of the quality of products, which determined the direction and relevance of research on the production of environmentally safe young beef.

Under modern conditions of cattle breeding, this problem can be solved through the rational use of zoned breeds of domestic and imported reproduction. In the Northern Region of Kazakhstan, beef cattle are mainly presented by the livestock of the Kazakh White-Head, Aberdeen Angus, Hereford, and Auliekol breeds. In this regard, the animals of these breeds should become the main reproducing category for the production of crossbred animals in beef herds.

Studies of animal breeders from CIS and non-CIS countries have shown that one of the

methods to increase meat productivity, early growth of young stock and their profitability is to cross domestic breeds with foreign highly productive breeds of beef cattle (Amerkhanov, 2004; Plokhikh, 2009).

The results of the study of domestic and foreign scientists show that crossbreeds obtained by commercial crossbreeding with bulls of beef breeds are characterized by high rates of meat productivity. However, the peculiarities of comparative growth, development, and formation of meat productivity, the adaptive abilities of purebred and crossbred young stock obtained from cows and bulls of combined and beef breeds in the Northern Region of Kazakhstan remain understudied (Garmayev, 2007; Kazhgaliyev and Matakbayev, 2016; Kosilov et al., 1986; Gubashev et al., 2008).

One of the most promising and effective methods for increasing meat productivity in commercial livestock farming is the industrial crossbreeding of dairy and combined breed cows with servicing bulls of beef breeds. This allows obtaining crossbred animals of different breeds for fattening, as well as determining the effectiveness of beef crossbreeding (Zelenov, 2006; Levakhin, 2002; Tarasov et al., 2010; Kayumov et al., 2013).

Meat is the most important high-calorie food. In the meat balance of the country, beef takes the first place (45-48% of the total meat produced). In a number of regions of our country, specialized beef breeds are used to produce beef. The most widespread are Kazakh White-Head, Auliekol, Hereford, Aberdeen Angus and others. The livestock of these breeds is distinguished by high meat productivity; it is quickly fattened and is well fed in summer on pastures.

The young stock of the Hereford, Kazakh White-Head breeds is the most meat-productive; meat productivity of Auliekol and Aberdeen Angus young stock is somewhat lower, but these breeds have very high meat quality indicators.

Aberdeen Angus breed is characterized by endurance and frost resistance. Animals of this breed acclimatize well and easily withstand high and low temperatures, so they can be kept outdoors all year round. At the same time, they continue to gain in weight on average 0.7 - 0.8 kg per day (up to 2-3 kg at very intensive fattening); the main thing is to ensure sufficient amount of good quality feed. The taste and nutritional qualities of high-quality marbled beef are not inferior to the meat of Hereford breed and is considered ideal for steaks: the so-called "marbled" beef, tender, juicy, with thin layers of

fat. This structure of meat arises from the fact that in Aberdeen Angus cattle, the most part of fat is deposited not under the skin but in their muscles.

Aberdeen Angus meat is characterized by marbling. Polledness and excellent meat properties are inherited by calves even when crossed with other breeds. Angus breed is usually crossed with dairy breeds to improve the meat qualities of the latter or to improve the herd.

Aberdeen Angus breed is considered the best beef breed in the world in terms of carcass, meat quality and weight gain rate. In addition, it is the earliest maturing breed: heifers are settled at 14-15 months (not at 18 months as for the most breeds) with a minimum weight of 320-350 kg; at 18 months, bulls weigh 450-500 kg.

It is economically profitable breed: there is no need for substantial barns with heating, a large number of animal feed and expensive treatment. Angus breed has good health, can be free grazed in the presence of feed all year round. The calves are small at birth; the calving is easy. The weight of Aberdeen Angus calves at birth is 16-23 kg, while the weight of calves of other breeds is 20-30 kg. Due to the low birth weight, calving is easy, without complications even in first-calf heifers. From the very first day calves graze with their mother and remain at foot until 8 months of age. There is a high yield of calves per 100 cows (95-99% up to 100%) and almost zero mortality of calves. Calves have good health and high immunity, which is obtained from the mother for the period of suckling. Cows have good maternal qualities.

The Kazakh White-Head breed combines the high meat qualities of the Herefords, the adaptiveness and endurance of the local Kazakh and Kalmyk cattle. These animals withstand the heat of dry steppes, severe cold with winds and blizzards in winter. One of the most valuable features of the Kazakh White-Head breed is its adaptability to use vast, often low-productive pastures, good health and endurance, the ability to easily cover the distance during grazing and drifts, due to which it is successfully bred in all regions of the Republic of Kazakhstan.

Hereford cattle are characterized by a developed maternal instinct; they are economical, unpretentious, early maturing, flexible, obedient, have marbled meat, and cost-effective. White head and white belly are the characteristics of the Hereford breed, which is consistently inherited when crossed with other breeds. Livestock feeds well, gives high-quality marbled meat. The largest population is concentrated in Almaty, Akmola,

North Kazakhstan and Kostanay regions. These animals were mainly imported from Canada, USA, Australia, Germany, Czech Republic, Denmark, Ireland, Russia and other countries of near and far abroad. High adaptability to different climatic conditions, endurance and resistance to long-term stay on pastures, good tolerance to long drifts leave no doubt about the further development of this breed in the boundless steppes of Kazakhstan.

The Auliekol breed was established in 1992; it was bred in Kostanay Region in the Moskalevskiy SNR by crossbreeding the Kazakh White-Head breed with an admixture of the blood of the best world breeds: Charolais and Aberdeen Angus beef breeds. The breeding of a new breed took more than 30 years. This breed is very unpretentious and adaptive to our climate. The Auliekol breed has great potential. It successfully develops and brings a steady profit. Average daily calf weight gain is 1.5-1.7 kg. The taste qualities of Auliekol breed capable of producing up to one and a half kilograms of valuable meat per day are highly appreciated.

Indicators of the most important economic traits of Auliekol breed:

- the growth rate of bulls aged from 8 to 15 months: 1095 g,
- the live weight at the age of 15-18 months: 450-540 kg;
- the weight of bull calves at slaughter at 18 months: 305 kg;
- slaughter carcass yield: 60-63%;
- live weight of bulls: 950-1050 kg; of cows: 540-560 kg,
- milking capacity of adult cows: 228 -236 kg (live weight of calves aged 8 months).

Currently, in 13 regions of Kazakhstan, there are 108 thousand heads of Aberdeen Angus breed, more than 22 thousand heads of Hereford breed, 72 thousand heads of Kazakh White-Head breed, and 49.0 thousand heads of the Auliekol breed.

In this regard, the purpose of the research was to study the effectiveness of the breed transformation under the Sybaga program in the Northern Region of Kazakhstan, by accumulation (upgrading) crossbreeding of regional breeds of domestic and imported reproduction in order to improve the productive and breeding qualities of low-productive, outbred cattle.

## MATERIALS AND METHODS

Studies were conducted in farms of the Northern region (Stan LLP, Tishkov OV farm,

Beysen farm and Saltanat farm) from January 15 to October 30, 2018.

The live weight of the crossbred bulls of the 2<sup>nd</sup> generation was determined by weighing the young stock at birth, at the age of 6 and 8 months. Weighing was carried out individually in the morning before feeding. According to the results of weighing of crossbred bulls, absolute, average daily and relative gains in live weight were calculated.

Being an external appearance of the body composition, the exterior of the animal is closely related to the productivity and general condition of the body.

During the study period, linear measurements of the body of crossbred bulls at 8 months of age were studied. With the use of special measuring instruments (measuring stick, measuring tape, measuring divider), the bulls' barrel was measured: height at withers, chest breadth behind the shoulder blades, chest depth, slanting length, chest girth behind the shoulder blades, pastern girth.

Based on these measurements, the following body indices were calculated: long-leggedness, lengthiness, boniness, blockiness, thoracic and pelvic-thoracic indices.

The breed of crossbred bulls was determined on the basis of documents of origin with mandatory inspection of livestock to establish the expressiveness of the type. Digital material is processed biometrically according to A.V. Kryuchkov, I.V. Marakulin (Kryuchkov and Marakulin, 2011) using Microsoft Excel 2017.

## RESULTS AND DISCUSSION

To conduct the study, commercial farms of the Northern Region were selected, namely Stan LLP, Tishkov O.V. farm, Beysen farm, and Saltanat farm of Karaganda Region.

### Production and economic characteristics of cattle breeding at Stan farm.

Stan LLP is located in the Mamlyut district of North Kazakhstan region. The farm was established in 2013; the main activity is beef cattle breeding and crop farming. The climate in the region of the enterprise is extremely continental. The winter is cold, long, and severe in some years. The duration of the frost period is 245 days, and the duration of winter is 5–5.5 months. Summer is hot, 25-30 degrees on average, windy. Annual rainfall is 200-300 mm.

At the beginning of 2018, the livestock population in the farm amounted to 270 heads,

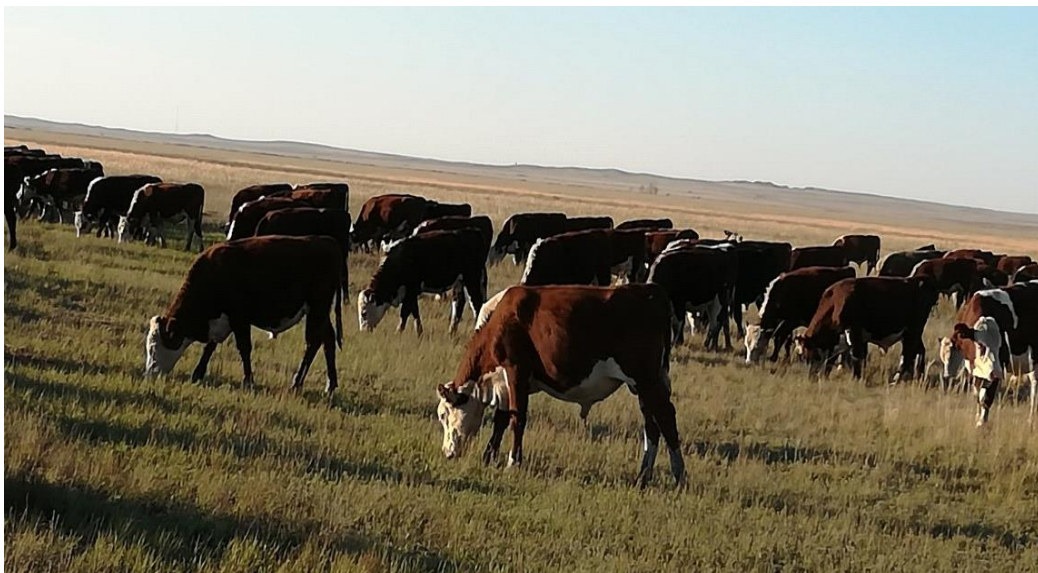
including 10 purebred servicing bulls of the Aberdeen-Angus breed acquired under the Sybaga program and 195 heads of outbred cows, mainly of the dairy beef production. The farm has been engaged in breed transformation since 2013 under the Sybaga program; more than 60 000 \$ (USD) has been invested in the project. During this time, more than 350 bulls and super-

replacement heifers have been delivered to the feedlots of Akmola and Kostanay regions. As a result of the breed transformation in the Stan farm, calves of the 2<sup>nd</sup> generation were obtained.

The farm has its own agricultural land, which allows providing livestock with a home-produced feed.



**Figure. 1. Mixed bulls of the 2<sup>nd</sup> generation of Aberdeen-Angus breed in STAN LLP**



**Figure. 2. Mixed bulls of the 2<sup>nd</sup> generation Hereford breed in the Tishkov O.V. farm**  
*Production and economic characteristics of cattle breeding at Beyssen farm*

**Production and economic characteristics of cattle breeding at Saltanat farm.**

The Saltanat farm is located in Zhansary village of Ossakarov district, Karaganda region. The farm was established in 2001; the main activity is beef cattle breeding. The climate in Ossakarov district of Karaganda Region is extremely continental. The winter is cold, long, and severe in some years. The duration of the frost period is 225 days, and the duration of winter is 5–5.0 months. Summer is hot, 30-35 degrees on average, windy. Wind strength reaches 25-39 m/s. Annual rainfall is 180-285 mm.

At the beginning of 2018, there were 550 heads of livestock in the farm, including 10 purebred servicing bulls of the Kazakh White-Head breed, acquired under the Sybaga program and 300 heads of outbred cows, mainly of the dairy beef production. The total area of agricultural land is 3,450 hectares, including 600 hectares of arable land, 2,400 hectares of pastures, and 450 hectares of hayfields. The livestock of the Saltanat farm is fully provided with a home-produced feed.

**Production and economic characteristics of cattle breeding at Tishkov O.V. farm.**

The Tishkov O.V. farm is located in Burabay district of Akmola Region. The climate in the region of the enterprise is extremely continental. The winter is cold, long, and severe in some years. The duration of the frost period is 245 days, and the duration of winter is 5–5.5 months. Summer is hot, 25-30 degrees on average, windy. Annual rainfall is 200-300 mm. The farm was established in 2009; the main activity is beef cattle breeding and crop farming.

Since 2016, 4 purebred servicing bulls of the Hereford breed have been purchased under the Sybaga program. The total livestock is 217 heads, including breeder's stock, which consists of 120 heads of low-productive, outbred cows. In 2018, 93 crossbred calves of the 2<sup>nd</sup> generation were obtained. The farm has its own agricultural land, which allows providing livestock with a home-produced feed.

The Beyssen farm is located in Amangeldy district of Kostanay region. The nature of the farm surface is heterogeneous: small hills, hills, poorly divided flats and river valleys. The formation of contrasting forms of relief is due to the complexity of the geological structure.

The climate is extremely continental with aridity increasing to the south. The average temperature in May is +14-18°C; in July, it is 20-

24°C. In winter, frost sometimes reaches -30°C; summer is hot, sometimes cold and rainy, with dust storms and hot dry winds. Annual rainfall is 200-300 mm. The vegetation is rich in herbs, feather grass, and sheep fescue.

The farm has been working under the Sybaga program since 2016; during this period, 4 purebred servicing bulls of the Auliekol breed and 157 heads of outbred, low-productive cows were purchased. The farm has more than 3,000 hectares of agricultural land used for grazing livestock, including 450 hectares of hayfields. To date, 88 crossbred calves of the 2<sup>nd</sup> generation have been obtained. Animals are 100% supplied with feed. The farm purchases compound feed and mineral feed from the third parties.

The solution of the problem of the beef cattle breeding development during the development of regions with specific natural and economic conditions by importing specialized beef breeds takes a long time. Purchasing the breeding stock is very expensive. Therefore, the creation of new arrays of beef cattle in such regions is carried out by transforming animals of local populations.

For the research on the breeding transformation in each of the above farms, 25 heads of crossbred bulls born in the period from January 25 to February 25 were selected. The difference in age was no more than one month.

To determine the growth indicators, the productivity of farm animals in animal husbandry, it is common to use such indicators as average daily live weight gain, relative live weight gain, absolute live weight gain. These indicators help to make an in vivo assessment of livestock beef productivity, as well as determine the expressiveness of type and breed.

The results of the study of the growth and development of crossbred young stock show that the calves of the studied breeds as a result of the accumulation crossbreeding had different indicators. The live weight of calves was determined by weighing on 1.5-ton scales, early in the morning before feeding. The animals were weighed individually, the individual number of each bull was determined; the obtained information was recorded in the primary recording log. Weighing data are presented in table 1.

The weighing results show that the live weight of crossbred bulls of the 2<sup>nd</sup> generation of the Aberdeen Angus breed at birth was the smallest (22.7 kg), which is typical of purebred animals; the live weight of the crossbred bulls of the 2<sup>nd</sup> generation of the other three breeds differed slightly from 26.3 kg for Kazakh White-Head up to

27.7 kg for Auliekol breed.

The data of live weight obtained in the process of studying the growth and development of crossbred bulls in different age periods indicate that crossbred bulls of the 2<sup>nd</sup> generation of the Kazakh White-Head, Hereford and Auliekol breeds at the age of 6 and 8 months were inferior to the standard of the 1<sup>st</sup> class breed. Thus, crossbred bulls of the Kazakh White-Head, Hereford and Auliekol breeds were inferior to the standard of the 1<sup>st</sup> class breed at the age of 6 months by 3.2 kg (1.9%), 0.2 kg (0.12%) and 14.8 kg (8.2%), respectively and at the age of 8 months by 4.3 kg (2%), 1.1 kg (0.5%) and 2.4 kg (1.2%) respectively. The crossbred bulls of Aberdeen-Angus breed at the age of 6 months exceeded the standard of the 1<sup>st</sup> class breed by 1.7 kg (1%), at the age of 8 months by 9.2 kg (4.6%). According to the results of weighing of crossbred bulls, absolute, average daily and relative gains were calculated. The results of the calculation of the absolute weight gain are shown in Table 2.

An analysis of the absolute gain in live weight of crossbred bulls shows that higher gains in live weight from birth to 6 months of age were observed in crossbred bulls of the 2<sup>nd</sup> generation of the Aberdeen-Angus breed.

The absolute weight gain of crossbred bulls of the Aberdeen-Angus breed from birth to 6 months of age was 149.9 kg, which is 8.5 kg (6%) higher than the growth of crossbred bulls of Kazakh White-Head, 6.1 kg (4.3%) higher than Hereford breed and 11.5 kg (8.4%) higher than Auliekol breed.

The dynamics of growth shows that the highest weight gains of crossbred bulls were observed in the initial period of their growing up to 6 months of age. With age, the absolute gains in all analysed breeds tended to decrease at 8 months of age (max-min) by 37.3% for Aberdeen Angus, by 47.7% for Kazakh White-Head, by 35.3% for Hereford and by 57.1% for Auliekol breeds. The data on average daily weight gain are shown in table 3.

The average daily weight gain of crossbred bulls corresponds to their absolute weight gain. The maximum average daily gain was observed at 6 months of age in the Aberdeen-Angus crossbred bulls (827.7 g), the Kazakh White-Head bulls (780.5 g), the Hereford bulls (793.8 g) and Auliekol bulls (763.8 g).

With age, similar to the absolute weight gain, the average daily weight gain tended to decrease (Table 4).

The relative weight gain of studied bulls

showing tension, growth energy in all studied groups decreased with age. In crossbred bulls of the Aberdeen Angus breed, the relative weight gain from birth to 6 months was 656.4%, the gain of Kazakh White-Head was 534.2%, 531.2% for Hereford, and 496.4% for Auliekol; that is the growth energy is most pronounced in crossbred bulls of the Aberdeen-Angus breed and minimally pronounced in Auliekol bulls. At the age of 7-8 months, the maximum growth energy of 23.3% was noted in the crossbred bulls of the Kazakh White-Head breed, and the minimum growth energy of 19.6% was noted in bulls of the Auliekol breed.

Exterior and body composition are one of the important indices of cattle assessment. The body composition of animals makes it possible, first of all, to have an idea about the expressiveness of breed features. Exterior forms also provide some opportunity to assess the level of beef productivity, the biological resistance of the organism to various external factors in connection with its use.

The classics of the domestic zootechnics indicated that only the animals with sturdy body composition fully met the economic and biological requirements. Although the exterior, the type of body and the level of beef productivity are highly dependent on the feeding and housing conditions, heredity has no less impact on these qualities of cattle.

In our studies, the bulls of different breeds, when fed rationally and kept in conforming conditions, had differences in certain exterior features, as well as appearance and body type. The body measurements of bulls of different breeds were made at 8 months of age. In terms of exterior items, the highest height at the withers, chest breadth, chest depth, slanting body length and pastern girth, the crossbred bulls of the 2<sup>nd</sup> generation of the Auliekol breed were superior to the Aberdeen-Angus, Hereford and Kazakh White-Head breeds (Table 5).

Table 1 - The live weight of crossbred bulls of the 2<sup>nd</sup> generation, kg (n = 25)

Age of studied calves	Breed and breed standards							
	Aberdeen Angus x local graded	Breed standard	Kazakh White-Head x local graded	Breed standard	Hereford x local graded	Breed standard	Auliekol x local graded	Breed standard
At birth	22.7±0.79	18-24	26.3±1.1	18-27	26.9±0.89	24-30	27.7±0.97	25-30
6 months	171.7±3.3	170	166.8±3.5	170	169.8±3.2	170	165.2±3.7	180
8 months	209.2±4.8	200	205.7±4.7	210	208.9±4.8	210	197.6±4.3	200

Table 2 - Absolute gain in live weight of crossbred bulls, kg (n = 25)

Age of studied calves	Farm name			
	STAN LLP	Saltanat farm	Tishkov O.V. farm	Beysen farm
	Breed			
	Aberdeen Angus x local graded	Kazakh White-Head x local graded	Hereford x local graded	Auliekol x local graded
From birth to 6 months	149.0 ±2.1	140.5±1.8	142.9±2.1	137.5±1.2
7-8 months	37.5±2.3	38.9±1.5	39.1±1.9	32.4±1.7
On average	23.3±1.8	22.4±1.3	22.7±2.2	21.2±1.6

Table 3 - Average daily weight gain of crossbred bulls of the 2<sup>nd</sup> generation, g (n = 25)

Age of studied calves	Farm name			
	STAN LLP	Saltanat farm	Tishkov O.V. farm	Beysen farm
	Breed			
	Aberdeen Angus x local graded	Kazakh White-Head x local graded	Hereford x local graded	Auliekol x local graded
From birth to 6 months	827.7±8.3	780.5±12.4	793.8±9.3	763.8±11.2
7-8 months	625.0±8.8	648.3±14.4	651.6±7.6	540.0±12.6
On average	777.7±11.2	747.5±16.2	758.3±10.2	708.0±13.1

Table 4 - Relative weight gain of crossbred bulls, % (n = 25)

Age of studied calves	Farm name			
	STAN LLP	Saltanat farm	Tishkov O.V. farm	Beyssen farm
	Breed			
	Aberdeen Angus x local graded	Kazakh White-Head x local graded	Hereford x local graded	Auliekol x local graded
From birth to 6 months	656.4	534.2	531.2	496.4
7-8 months	21.8	23.3	23.0	19.6

Table 5 – Body measurements of crossbred bulls at the age of 8 months, cm (n = 25)

Measurements	Breed			
	Aberdeen Angus x local graded	Kazakh White-Head x local graded	Hereford x local graded	Auliekol x local graded
Height at withers	106.2±1.20	106.7±0.3	108.7±0.5	109.3±0.4
Height at hips	110.6±1.3	110.2±0.9	113.7±1.2*	111.5±2.3
Chest breadth	34.8±0.8	33.2±0.5*	34.3±0.8	35.8±1.1
Chest depth	45.4±0.6	43.4±0.6	44.2±0.7	46.6±0.9
Chest girth	148.7±1.68	147.2±0.7*	148.6±1.8	145.8±1.8
Body slanting length	125.8±1.45	125.2±1.5	127.0±1.7**	127.4±2.3
Width at hook bones	37.5±0.51	36.5±0.4**	38.1±0.3	37.6±0.6
Pastern girth	16.6±0.11	18.0±0.3	17.8±0.2	18.2±0.5

\*p&lt;0.05;\*\*p&lt;0.01;\*\*\*p&lt;0.001



The Hereford crossbred bulls were superior to their peers by measurements of chest girth behind the shoulder blades, the width at hook bones.

Analysis of the dynamics of body measurements gives a characteristic of the formation of the exterior features of animals. At the same time, it should be noted that in absolute terms of body measurements one could judge only the comparative development of its individual items.

In general, it is difficult to judge the body composition by individual measurements. Therefore, to characterize the general appearance the relative indices were used together with the calculations of the body composition indices of crossbred bulls of different breeds. Comparison of indices of bulls of different breeds makes it possible to judge the expressiveness of the desired features, namely the proportionality of their development based on the comparison of measurements (Table 6).

Our studies have shown that the indices of long-leggedness, boniness, and thoracic index of crossbred bulls of the Hereford, Kazakh White-Head and Auliekol breeds are almost the same, the difference is 0.1%, 0.3% and 1.1%, respectively. The index of lengthiness and blockiness is better expressed in crossbred bulls

of the Aberdeen Angus breed and is 118.4 and 118.2% respectively. The highest value of the pelvic-thoracic index is observed in 8-months-old crossbred bulls of the Auliekol breed and is 95.2%.

At the same time, the above-mentioned difference in the main measurements depending on the breed is unreliable, which can only be characterized by the revealed tendency of the superiority of measurements in bulls of different breeds.

Thus, according to the results of body measurements of crossbred bulls and on the basis of their calculated indices, it can be noted that crossbred Aberdeen Angus bulls are characterized by a more pronounced beef type, they are less long-legged, less bony and more blocked, with well-developed hindquarter, wide and deep chest and strong bones compared to the crossbred bulls of Hereford, Kazakh White-Head and Auliekol breeds.

Of course, based on the data on the weight gain and development of crossbred bulls by body weight and body measurements, it is impossible to judge their productive qualities, but certain features of the exterior and the body composition indicate that bulls are capable of transmitting hereditary qualities to offspring.

**Table 6 – Body composition indices of crossbred bulls, %**

Body composition indices	Breed			
	Aberdeen Angus x local graded	Kazakh White-Head x local graded	Hereford x local graded	Auliekol x local graded
Long-leggedness	57.2±0.6*	59.3±1.2	59.3±0.8	59.2±1.4
Lengthiness	118.4±1.7	117.3±3.2**	116.8±2.2	118.1±2.6
Boniness	15.6±0.3	16.7±0.6	16.4±0.2**	16.7±0.4
Blockiness	118.2±2.6	117.6±3.1	117.0±1.6	114.4±2.2
Pelvic-thoracic	92.8±3.0	91.0±4.0	92.7±3.5	95.2±2.8*
Thoracic index	76.6±1.7**	76.5±2.1	77.6±1.4	76.8±1.9

## CONCLUSION

The weighing results presented in Table 1 show that the live weight of crossbred bulls of the 2<sup>nd</sup> generation of the Aberdeen Angus breed at birth was the smallest (22.7 kg), which is typical of purebred animals; the live weight of the crossbred bulls of the 2<sup>nd</sup> generation of the other three breeds differed slightly from 26.3 kg for Kazakh White-Head up to 27.7 kg for Auliekol breed.

The live weight data obtained in the process of studying the growth and development of crossbred bulls in different age periods indicate that crossbred bulls of the 2<sup>nd</sup> generation of the Kazakh White-Head, Hereford and Auliekol breeds at the age of 6 and 8 months were inferior to the standard of the 1<sup>st</sup> class breed. Thus, crossbred bulls of the Kazakh White-Head, Hereford and Auliekol breeds were inferior to the standard of the 1<sup>st</sup> class breed at the age of 6 months by 3.2 kg (1.9%), 0.2 kg (0.12%) and 14.8 kg (8.2%), respectively and at the age of 8 months by 4.3 kg (2%), 1.1 kg (0.5%) and 2.4 kg (1.2%) respectively. The crossbred bulls of the Aberdeen Angus breed at the age of 6 months exceeded the standard of the 1<sup>st</sup> class breed by 1.7 kg (1%), at the age of 8 months by 9.2 kg (4.6%). According to the results of crossbred bulls weighing, absolute, average daily and relative gains were calculated. The results of the calculation of the absolute gain are shown in Table 2.

An analysis of the absolute gain in live weight of crossbred bulls shows that higher gains in live weight from birth to 6 months of age were observed in crossbred bulls of the 2<sup>nd</sup> generation of the Aberdeen-Angus breed.

The absolute weight gain in crossbred bulls of the Aberdeen-Angus breed from birth to 6 months of age was 149.9 kg, 8.5 kg (6%) higher than the growth of crossbred bulls of Kazakh White-Head, 6.1 kg (4.3%) higher than Hereford breed and 11.5 kg (8.4%) higher than Auliekol breed.

Thus, according to the results of a comparative study of growth and development, linear growth indicators of bulls of different breeds, it can be noted that crossbred Aberdeen Angus bulls are characterized by a more pronounced beef type, they are less long-legged, less bony and more blocked, with well-developed hindquarter, wide and deep chest and strong bones compared to the crossbred bulls of Hereford, Kazakh White-Head and Auliekol breeds.

Of course, based on the data on the weight gain and development of crossbred bulls by body weight and body measurements, it is impossible to judge their productive qualities, but certain

features of the exterior and the body composition indicate that bulls are capable of transmitting hereditary qualities to offspring.

## CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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## AUTHOR CONTRIBUTIONS

The Kazhgaliyev, Shurkin, Bekkozhin designed and conducted the study. Aubakirov, Zhumagazieva conducted an analysis of the data. Kazhgaliyev, Bekkozhin on the basis of the received data made the conclusion of research. All authors have read and approved the final version. All authors read and approved the final version.

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