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Adaptation of the Third Generation Aberdeen Angus Heifers in the North Kazakhstan Region

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Abstract: The article presents research materials on the adaptive and productive qualities of the third-generation heifers of Aberdeen Angus cattle in the conditions of the "Zholdasbay-agro" farming enterprise of the North Kazakhstan region. The object of study was the growth and development of third-generation heifers obtained by Canadian and European selection of the Aberdeen-Angus breed. According to the results of the study and the summary of clinical signs, the frequency of antenatal hypotrophy in newborn calves of the Aberdeen-Angus breed of Canadian selection was 12.3%, European 8.7%. The research results showed that the relative growth rate in European calves up to 6 months is higher than in peers of Canadian breeding, but in the period from 6 to 8 months, calves obtained from cows of the second generation of Canadian breeding are superior to calves of European selection. The established tendency of a lower growth rate of heifers obtained from cows of Canadian breeding may be associated with an increase in the tension of regulatory mechanisms that ensure the adaptation of animals to new environmental conditions.

Keywords: Physiological Adaptation, Selection, Growth and Development, Aberdeen Angus Cattle

Introduction

One of the most important problems of the agricultural sector of the Republic of Kazakhstan is providing the population with food, especially beef, the solution of which determines the need for the development of the beef sector, both to increase the national beef herd and to raise its productivity (Amerkhanov, 2011). The increase in the number of beef cattle in Kazakhstan will be through the use of domestic resources, as well as by importing foreign genetic material. Northern Kazakhstan is a favorable location for the development of the beef sector as it has large areas of available land for grazing and grain production.

An increase in the number of beef cattle in Kazakhstan is carried out using domestic resources, expanded reproduction of herds of farmed breeds, as well as by importing a foreign gene pool (Kalashnikov and Levakhin, 2003).

In recent years, animals of Western European, and Canadian (USA) breeds have been imported to the Republic of Kazakhstan, the use of which is carried out without taking into account the adaptive capabilities of their body to new breeding conditions. The largest share of imported breeding resources falls on the breed meat productive directions Hereford and Aberdeen Angus, which come from different countries with highly differentiated climatic conditions (Kazhgaliyev *et al*., 2019; Kazhgaliyev and Matakbaev, 2016).

For example, over the course of several years, over 55 thousand heads of livestock of breeding meat breeds (Aberdeen Angus, Hereford) were imported into the country from Europe, Australia, America (USA 33.6% of the total, Australia 22.8%, Canada 12.6%, Russia 8.3%, Austria 7.1%, Ireland 6.3%, Czech Republic 5.2%, Denmark 3.1%, Ukraine 0.5%, France 0.4%) (Stepanov *et al*., 2015).

Most breeds in the world are bred in specific climatic conditions, which limits their distribution to other countries of the world. When exposed to new living conditions, animals inevitably undergo profound physiological adaptation. Physiological adaptation is manifested in the body's ability to maintain the vital parameters of homeostasis under stressful conditions (Belousov *et al*., 2002).

The most important criteria for adaptation of livestock imported from abroad are its high productivity, normal reproductive function, adaptability to intensive industrial technology, local climatic conditions, and metabolic

processes in the cells of various organs and systems, the intensity of which largely depends on the functional maturity of the body. In this regard, according to the correspondence of physiological indicators, newborn animals are divided into physiologically mature (normotrophic) and physiologically immature (hypotrophic).

And also, the acclimatization of imported animals is never complete, that is, the first imported cattle cannot fully adapt to the environment of the place of arrival and its negative consequences may appear in the next generations of animals. Therefore, the study of acclimatization is usually carried out on animals of three genetic-ecological generations (Kalashnikov and Levakhin, 2003; Kazhgaliyev *et al*., 2019).

Imported animals can successfully live and breed, but they can lose their distinctive biological and productive qualities, to which they were introduced (Kuznetsov, 1976). Therefore, the significance of the research work is due to the development of the scientific basis for the acclimatization of imported livestock breeds in order to obtain the maximum possible results of realizing the high genetic potential of the productivity of Aberdeen Angus animals in northern Kazakhstan. This will make it possible to have a highly productive herd of well-adapted animals of the Aberdeen-Angus breed in the North Kazakhstan regions for forage, technological and weather conditions (Kazhgaliyev *et al*., 2020; Kazhgaliyev and Matakbaev, 2016).

Aberdeen-Angus cattle are characterized by high growth rates and good meat quality (Tokysheva *et al*., 2022).

According to many scientists, the use of imported meat breeds brought into different climatic conditions from Canada, USA, England, and Uruguay, notes that imported animals showed high meat productivity, reproductive ability, and preservation only under conditions of abundant feeding.

Furthermore, maintaining high productivity of animals capable (Kalashnikov and Levakhin, 2003). of producing high-quality meat products should be ensured by optimizing conditions for keeping and feeding, which is especially important for imported animals needing to acclimatize and adapt to new environmental conditions.

When exposed to new living conditions, animals go through significant physiological changes, while they have to adapt to new living conditions or adapt. The most important criteria for imported livestock from abroad are high productivity, high fertility, adaptability to intensive industrial systems, local climate conditions, and feed efficiency (Jump, 2005).

The acclimatization of imported animals is never complete and its negative effects may occur in subsequent generations of animals. Therefore, the study of acclimatization is usually carried out on animals of up to three generations (Kalashnikov and Levakhin, 2003; Kazhgaliyev *et al*., 2019).

It is known that imported animals can successfully live and breed, but they can lose their distinctive productive and biological qualities, for which they were imported. Therefore, it is important to estimate the acclimatization of imported livestock breeds in order to obtain the best possible results and achievement of the high genetic productivity potential of animals Aberdeen Angus animals being imported into northern Kazakhstan. A greater understanding of the adaptability of this breed in Northern Kazakhstan will better inform this sector of the livestock industry (Shoman *et al*., 2019).

In recent years, animals of West European and North American breeds have been imported into our country, without taking into account the adaptive capabilities of these breeds to local conditions. The largest specific weight of imported breeding resources is among breeds of meat direction of Productivity-Hereford and Aberdeen Angus from various countries with very differentiated natural and climatic conditions.

Aberdeen Angus cattle are notable for their high growth rates and good meat quality. According to many scientists, the use of imported meat breeds (Hereford, Aberdeen Angus) brought into different climatic conditions from Canada, the USA, England, and Uruguay, it is noted that imported animals showed high meat productivity, reproductive ability, and livability only under the condition of heavy feeding (Belousov *et al*., 2002). of Hereford and Aberdeen Angus breed animals imported from Canada and the USA adapted most successfully.

In the North Kazakhstan region, the Aberdeen Angus breed is a relatively recent addition to the beef farming sector. In 2013, 393 animals (377 cows and 16 bulls) of Aberdeen Angus cattle were purchased from Canada and Europe onto a farm in northern Kazakhstan. All imported animals were hornless, of black color and healthy. Currently, the number of these cattle on the farm has doubled, and now it is 551, including 17 breeding bulls and 517 cows.

The research objectives, therefore, were to investigate the growth rates, mortality, and clinical and physiological parameters of the third generation of this breed.

In accordance with this, the goal was set to study the possibility of breeding beef cattle of Aberdeen-Angus breed of Canadian and European breeding in the Northern region of Kazakhstan.

The research objectives included the study of the physiological maturity of newborn calves obtained from imported animals and the establishment of their frequency of development of antenatal hypotrophy, as well as growth and development, clinical and physiological parameters of the third generation of this breed.

Materials and Methods

To achieve the stated goal of research and solving problems, standard zootechnical, hematological, and physiology-clinical research methods were used.

The studies were carried out in the «Zholdasbay-Agro» farming enterprise located in the northern zone of

the forest steppe. Observations and studies of a herd of Aberdeen Angus cattle on this farm were conducted.

Genetic value of the livestock-the method of assessing the pedigree value of EPD was used (expected progeny difference-expected prognosis of productivity or expected difference in offspring). Signs that are moderate in their heritability (from 20 to 30%), such as the growth rate, are also moderate in the degree of pronounced heterosis (about 5%). Highly heritable traits (from 30 to 50%), such as carcass weight, exhibit the lowest levels of heterosis.

Heifers of the third generation were kept according to the technology adopted at the farm, under their mothers on a suction up to 8 months of age. In winter, kept on an irremovable deep litter. And in the summer, they grazed on a pasture without additional feeding. To characterize the growth and development of experimental heifers, we used the results of weighing over growth periods.

One of the objectives of these studies was to assess the physiological maturity of newborn calves obtained from imported animals of the second generation and to establish their frequency of antenatal hypotrophy development. To this end, during the calving period (January-February of the current year), together with the specialists of the farm, an assessment of the physiological maturity of Canadian and European selection newborns was made by a set of clinical signs. The interpretation of the results was carried out in accordance with the recommendations of (Kuznetsov, 1976).

Based on the revealed clinical signs characterizing the general condition of newborn calves, normotrophy and hypotrophy were distinguished. Normotrophics included well-developed, physiologically mature calves that had proper development and good fatness, a short and smooth coat, a well-developed adipose layer, and a powerful sucking reflex (Fig. 1).

Hypertrophy included newborn calves with a pronounced developmental delay and physiological inferiority of both the organism as whole and individual organs and systems.

The exterior assessment was carried out by measuring the main measurements (height at the withers, height at the sacrum, chest depth, oblique length of the body, straight length of the body, circumference of the chest behind the shoulder blades, width of the chest, width of the back in the mackles, width of the back in the ischial tubercles, girth of the metacarpus, oblique butt length). Based on the results of the measurements, body indices were calculated.

In order to study the physiological maturity of newborns, growth, and development, the materials of our research were third-generation heifers obtained in the process of adaptation to the local climatic conditions of Northern Kazakhstan of the Aberdeen-Angus breed.

After calving of beef cattle of Aberdeen-Angus breed of Canadian and European breeding, the viable offspring received from them was evaluated. During the study period, 61 viable calves were obtained from 66 cows of Canadian selection (n = 61; 5 stillborn); from 64 analogs of the European selection of viable calf 63 (n = 63; 1 stillborn).

Thus, a subsequent assessment of physiological maturity was carried out in newborn calves of Canadian (61 heads) and European (63 heads) breeding, which included the determination of a complex of clinical signs and morphological parameters of the blood.

Experimental animals were kept indoors in winter deep on a pasture in the summer, with no additional feed offered. The investigated animals were all kept in the same housing and feeding conditions, calves were allowed to suckle up to 8 months of age. To assess the processes of growth and development, clinical and physiological parameters from the number of newborn calves obtained from experimental cows, two groups were selected by age and weight group I, heifers obtained from cows of Canadian selection (n = 12); group II, heifers obtained from cows of European selection (n = 12).

To determine the growth rate, average daily, and live weight.

The physical assessment was carried out by estimating the height at withers, height at the rump, chest depth, oblique body length, straight body length, chest girth behind the shoulder blades, chest width, quarters width at hook bone, quarters width at pin bones, metacarpus girth and oblique quarters length. Based on the results of measurements, body indices (leg length, format, density, chest, hip bone, and chest, overgrowth, bone, broad, volume) were calculated.

Body measurements of heifers were performed on days 10 and 6 months after birth (Table 1).

Catabolism (energy metabolism) is the process of metabolic decomposition, decomposition into simpler substances (differentiation), or oxidation of a substance, usually proceeding with the release of energy in the form of heat and in the form of ATP. To determine the catabolic coefficient used the formula K = M1/M2.

The catabolic coefficient (K) is determined by daily weighing the live weight of young animals, that by dividing the weight on the last day (M1) by the weight on the first day (M2)

Hematological studies were carried out in a clinical diagnostic laboratory. The morphological composition of the blood was determined on an automatic hematological analyzer, the Culter method (flow cytometry) took into account indicators of the number of red blood cells, hemoglobin, white blood cells, and dimphocytes.

Statistical processing of digital data was carried out using the method of variation statistics on a personal computer using the Microsoft Excel Program, and the value of the reliability criterion was determined according to the student-fisher table (Tokysheva *et al*., 2023).

Results and Discussion

The material basis of adaptive reactions in metabolic processes in the cells of various organs and systems, the

intensity of which largely depends on the functional maturity of the organism. In this regard, according to the correspondence of physiological indicators, newborn animals are divided into physiologically mature (normotrophic) and physiologically immature (hypotrophic).

One of the objectives of these studies was to assess the physiological maturity of newborn calves obtained from imported animals of the second generation and to establish their frequency of development of antenatal hypotrophy.

For this purpose, during the calving period (January-February of the current year), together with the specialists of the farm, an assessment was made of the physiological maturity of the newborn Canadian and European selection by a set of clinical features. The results were interpreted in accordance with the recommendations of (Kuznetsov, 1976). Based on the revealed clinical signs characterizing the general condition of newborn calves, normotrophy and hypotrophy were distinguished. Normotrophies included well-developed, physiologically mature calves that had proper development and good fatness, a short and smooth coat, well-developed subcutaneous tissue, and a pronounced sucking reflex (Fig. 1).

Analysis of examination results of newborn calves made it possible to establish the percentage of birth in the state of normo and hypertrophy obtained from cows of different origins (Fig. 2).

We established that 87.7% of calves of Canadian selection were born physiologically mature, while up to 12.3% of Canadian calves were born in the state of antenatal hypotrophy. The data obtained correlate with the data on calves grown in Europe (Ducháček *et al*., 2021).

live weight of physiologically mature calves corresponded to the average body weight of newborn Aberdeen Angus calves 23.6±1.62 kg in 79.2% of the number of calves examined. Their body temperature was within 39.2±1.35°C in 85.4% of the number of calves examined and the coefficient of catabolism was 1.01 in 83.4%. Physiologically mature calves had a lively temperament, characterized by the manifestation of general and local reflexes.

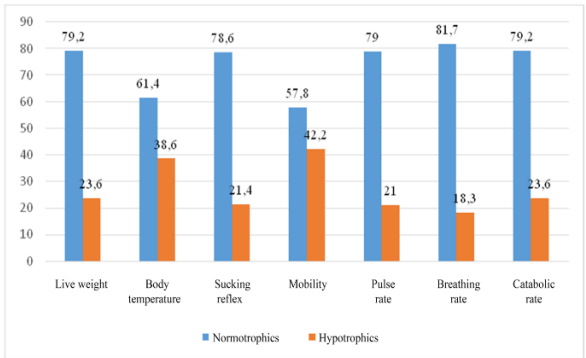

Fig. 1: Indicators and nature of the newborn calves' physiological maturity manifestation of the Aberdeen Angus breed of Canadian selection, % ($p<0.05$)

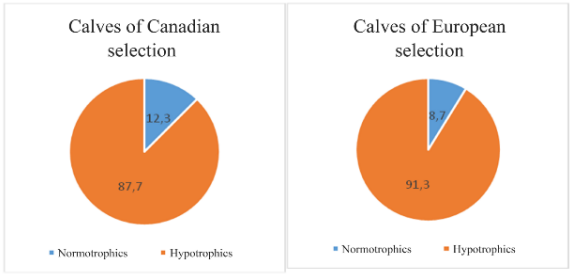

Fig. 2: The examination results of newborn calves obtained from cows of the second generation of Canadian (A) and European selection (B)

Normotrophic calves had a correctly developed skeleton without rachitic anomaly and moderately advanced muscles. After birth, the calves were in the "sleepy" state for half an hour, reacting poorly to peripheral distractions. As they adapted to environmental conditions, they began to mumble, raise their heads and make "smacking" sounds. The behavior was dominated by two motivations-food and thermoregulation. An hour after birth, they actively reacted to peripheral distractions and showed investigatory reflexes to sounds (mother's call and others). Normotrophic calves found the udder of the mother by themselves, took a teat in their mouth, and sucked quite vigorously. After a while, they released the teat from the mouth, poking the snout into the udder, after which the same or another teat was again taken into the mouth and continued to suck intensively and repeating so several times. During the day, the calf sucked 8-10 times. Defecation and urination are normal in frequency (excrement of feces occurred on average 3 times, urine 4 times a day). The rhinoscope was warm, and the mucous membranes were pale pink and moderately moist. The arterial pulse was of good filling 159±8.4 pulse beats per minute in 79% of the number of calves examined. The cardiac impulse of moderate strength. The tones are clear. The breathing is quite deep 57.8±4.5 respiratory movements per minute in 81.7% of the number of calves examined. During auscultation, extraneous noise was absent. Intestinal motility of moderate intensity was noted. Urination occurred in a natural position, and the urine was clear. Original feces departed within the first 2 h after birth.

All calves examined had six well developed incisor teeth, which corresponds to the physiological norm. As indicated above, 12.3% of Canadian calves were born in a state of antenatal hypertrophy. The most common symptom of physiological immaturity in Canadian calves was low reactivity, which was manifested in young animals from 17.4 to 21.4% by the absence of a sucking reflex and immobility. Such calves reacted poorly to the environment, hardly got up, the coordination of movement of some of them was impaired, lay with their heads thrown to the side. The gait is tense, steps are short, limbs are set forward, and movements were sometimes

inconsistent. Hypertrophic calves had an unsatisfactory overall development and fatness. The mucous membranes of hypotrophic are pale, and the skin is dry, pale, and easily gathered in folds that did not straighten out well. The subcutaneous fat layer in most calves was absent, the turgor was lowered. Auricles are comparatively softer, their ends hanging down. In most cases, the eyes sagged slightly, probably due to a hypotrophics' decrease in metabolism and the meager development of the subcutaneous fat layer, which during normal development protects the body from hypothermia. The body temperature of these animals was half a degree or more below the average 38.1±1.61°C ($p<0.001$). When observing hypotrophics, uneven, shallow breathing was noted: Sometimes elongated breaths and slow exhalations. Respiratory movements were about 39±3.57 per minute, which is 28.7% lower than physiologically mature ones had (16.6% of calves). In the study of the cardiovascular system, the following changes were observed: The cardiac impulse was strengthened, and well expressed both on the left and on the right. During auscultation, weakening, sometimes an increase in tones, was noted. The filling of arteries with blood and the pulse wave is reduced. The pulse rate was lower than the physiological norm by 59 beats per minute (101±17.3, $p<0.05$) in 18% of hypotrophic calves. All these changes indicated that the calf's cardiac activity during antenatal hypotrophy is characterized by functional insufficiency of muscle contractility.

The prevalence of congenital hypotrophy in European young stock was lower than in Canadian peers. 91.3% of calves were born physiologically mature. The most common signs of physiological immaturity in European young stock were: Low live weight at birth, and low body temperature (Fig. 3).

Thus, according to the set of clinical signs, the frequency of development of antenatal hypotrophy in newborn calves of the Aberdeen Angus breed of Canadian selection was 12.3%, European 8.7%.

For the exterior constitutional characterization, Aberdeen Angus heifers of Canadian selection obtained from imported animals were examined in comparison with their European counterparts. Body measurements of heifers were performed on days 10 and 6 months after birth (Table 1).

Analysis of measurements of 10 day old heifers showed that animals of Canadian selection are 5.7 cm ($p<0.05$) higher in height at withers and 5.6 cm (8.4%) higher in height at rump than the Aberdeen Angus breed of European selection. The advantage of Canadian selection heifers in terms of chest girth compared to their European counterparts was 8.9 cm (10.7%) and 1.7 cm (5.6%) in chest depth.

The chest width of the Canadian Angus was 1.2 cm more (6.3%). A significant advantage in measurements characterizing the development of the posterior third of the trunk (width in hook bone and oblique length of the quarters) was found in heifers of Canadian selection and amounted to 3.4 cm (17.9%, $p<0.05$) and 1.3 cm (6.5%), respectively. The breast width of Canadian Anguses on their 10th birthday also turned out to be 1.2 cm (6.3%) larger than that of European Anguses. A significant advantage in measurements characterizing the development of the posterior third of the trunk (width in macloca and oblique length of the butt) was found in heifers of Canadian selection and amounted to 3.4 cm (17.9%, $p<0.05$) and 1.4 cm (6.5%) respectively

An analysis of measurements obtained in the research of 6 month old heifers showed that animals of European selection were superior to Canadian Aberdeen Angus in height at withers by 1.8 cm (1.7%) and height at rump by 2.0 cm (11.1%). Heifers of European selection in measurements characterizing the development of the anterior third of the trunk exceeded Canadian ones in chest girth by 3.8 cm (2.3%), chest depth 4.2 cm (9.6%, $p<0.01$), chest width 4.8 cm (15.6%). According to measurements characterizing the development of the posterior third of the trunk, no significant differences were found between the heifers of the Canadian and European selection.

The proportionality of the development of young stock was determined by calculating body indices (Fig. 4-5). At the age of 10 days, the indices of leg length, density, and massiveness significantly exceeded European heifers by 21.7% ($p<0.05$), 15.1 and 8.3% ($p<0.01$), respectively, while the indices of format, chest, hip bone and chest, overgrowth, bone, broad and fleshing in them are less pronounced than in Canadian Aberdeen angus.

At the age of 6 months, Canadian Aberdeen Anguses significantly exceeded European ones in terms of leg length and broad indices by 8.3 ($p<0.05$) and 6.7% ($p<0.05$), respectively. In European Aberdeen Anguses, the indices of the chest, hip bone, and chest, density and massiveness are higher than in Canadian, by 3.8; 13.4 ($p<0.05$), 4.7, and 4.5% ($p<0.01$), respectively.

The expressiveness of the type index of European Aberdeen Anguses is 1.5% less than that of analogs. Thus, Canadian young stock reproduction of the descendants of the bulls of the local population, heifers, were characterized by stumpiness and compactness with a barrel-shaped body, heavy quarters third and lower back. However, the descendants of Canadian manufacturers were characterized by tall growth, lengthiness, and well-developed muscles of both the posterior third of the trunk and the back and lower back. Exterior evaluation of heifers of different origins carried out in our research, allowed us to establish that the young stock of Canadian selection was characterized by tall-growth and broad, while species of European selection were distinguished by pronounced compactness.

The growth rate of young stock characterizes its meat productivity and payment of feed. The dynamics of the live weight of experimental animals from birth to 8 months of age is Fig. 6.

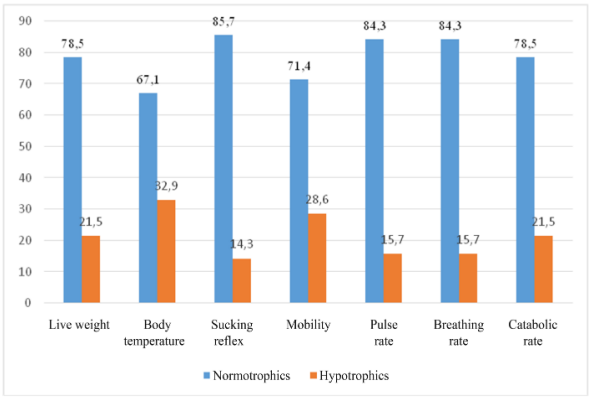

Fig. 3: Indicators and nature of the newborn calves' physiological maturity manifestation of the Aberdeen Angus breed of European selection, %

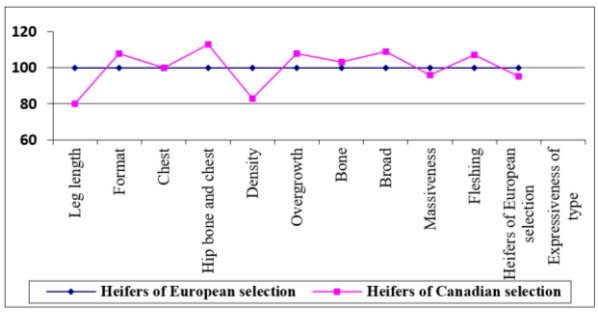

Fig. 4: Exterior graph profile of cows on the 10th day after calving (100% accepted indices of Aberdeen-Angus cows of European selection)

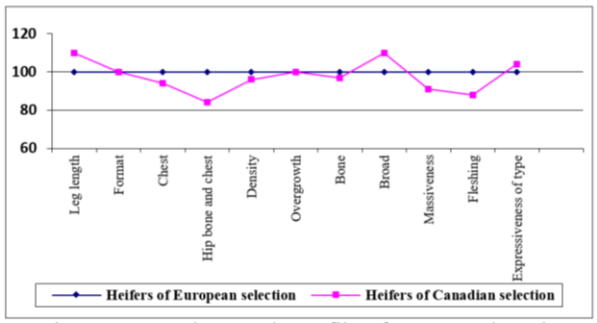

Fig. 5: Exterior graph profile of cows on the 6th month after calving (100% accepted indices of Aberdeen Angus cows of European selection)

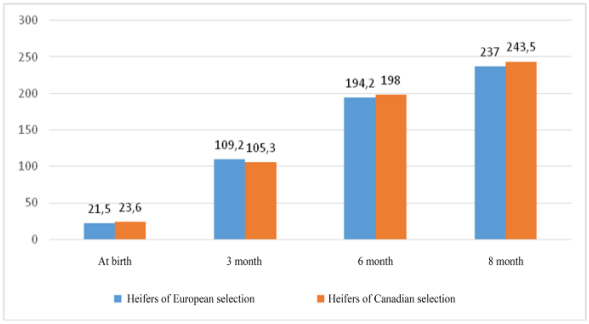

Fig. 6: Dynamics of live weight of experimental animals, kg (heifers of European and Canadian selection)

Comparing the results, it was found that the average live weight of the newborn heifers of the Aberdeen Angus breed of Canadian selection was 23.1±0.96 kg and exceeded the analogs of European selection by 2.1 kg ($p<0.05$). In the subsequent analyzed periods of postnatal development, the growth rate of European Aberdeen Anguses was higher. In particular, the live weight of European reproduction heifers at 3 months of age was 109.2±4.47 kg, which is 3.9 kg more ($p<0.05$) than in the young stock of Canadian selection. By the age of 8 months, the live weight of young stock of Canadian selection was 243.5±6.24 kg. Over the entire period of the experiment, the live weight of heifers of Canadian selection exceeded the same indicator for heifers of European selection by an average of 6.5 kg.

An analysis of the absolute live weight growth of animals of the experimental groups indicates that its maximum is in the period from birth to 6 months, regardless of the origin of animals. Heifers of European selection exceeded the same indicator at 3 months of age by 6.0 and 8%, respectively (Fig. 7).

In the period from 6 to 8 months, calves obtained from cows of the second generation of Canadian selection breeding surpass calves of European breeding of peers by 3%.

The dynamics of daily live weight gain of experimental animals had similar nature. Thus, a higher live weight growth was observed in heifers of European selection during the period from birth to 6 months (Fig. 8).

In the period from 6 to 8 months of growing, heifers of European selection also exceeded this indicator of Canadian counterparts by 5.9%. The results of the relative growth rate of experimental animals are presented in Fig. 9.

The age dynamics of the morphological and biochemical parameters of blood are associated with the functional development of the physiological systems of a growing organism and adaptation to changing living conditions. In the course of the research, the morphological and biochemical composition of the blood of Aberdeen Angus calves of European and Canadian selection was analyzed, the results of which are Tables 2 and 3.

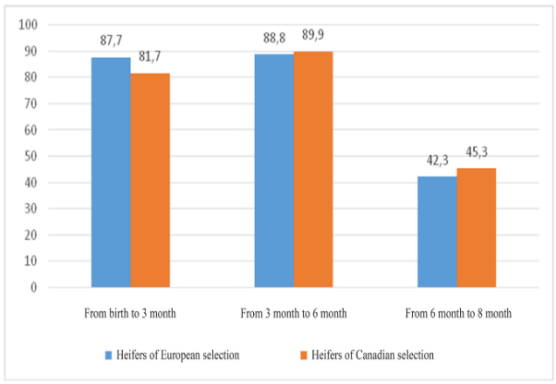

Fig. 7: Dynamics of absolute live weight growth, kg

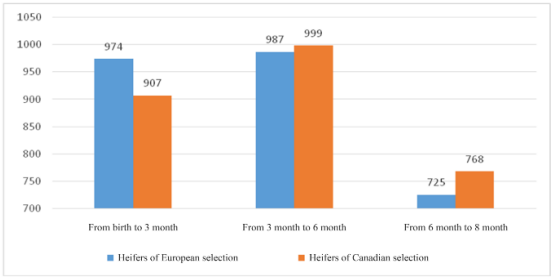

Fig. 8: Dynamics of daily live weight gain, g

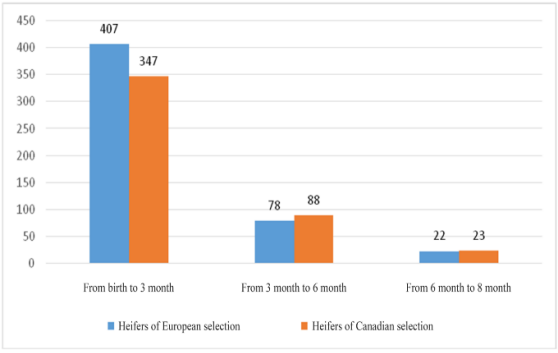

Fig. 9: Relative live weight growth of calves, %

A comparative analysis of the number and dynamics of morphological blood value showed that in the blood of calves Canadian selection content of erythrocytes, hemoglobin and leukocytes was higher than in European calves on the 10th day after birth, by 10.3% ($p<0.05$), 8.9 and 15.4% ($p<0.05$). By the age of 3 months, an increase in the number of red blood cells, hematoglobulin and white blood cells by 6.5% were recorded in the blood of calves of European selection; 3.8; 1.4% and Canadian selection by 9.2; 6.6 and 1.8% respectively, which indicates the metabolic rate in summer pasture period. Physiological changes in the morphological composition of blood in young stock obtained from imported animals correspond to structurally functional changes in the organism and determine their level of vital activity. Analysis of the morphological parameters of the blood of 3 month old calves revealed that the number of red blood cells, hematoglobulin, and leukocytes in the blood of Canadian animals exceeded the analogous indicators in calves obtained from European cows of the second generation by 14.3, 13, and 9.2%, respectively. A slight decrease in the number of red blood cells and hematoglobulin in animals of both groups was established at the age of 6 months by 6.6 and 8.5, 3.4 and 5.8%, respectively, with a simultaneous increase of leukocyte in blood counts by 1.1 and 2.6%. In a 6-month old young European selection, the erythrocyte, hematoglobulin, and leukocyte counts were 9.5, 8.8, and 7.1% lower than Canadian counterparts. As a part of the study, we analyzed the dynamics and number of individual types of leukocytes, which reflect the functional characteristics of the hematopoietic instrument and are associated with the adaptation of animals to the type of feeding and keeping conditions. The leukogram of 10 day old heifers obtained from imported Canadian cows of the second generation is characterized by high lymphocyte counts.

Table 1: Body measurements of aberdeen angus heifers of Canadian and European selection, cm

	Exploration period			
	Heifers of Canadian selection		Heifers of European selection	
Measurement	10^{th} day after birth	6^{th} month after birth	10^{th} day after birth	6^{th} month after birth
Height at withers	69.7±1.96	104.0±1,410	64,0±0,69*	105,8±0,52
Height at rump	72.3±2.19	110,3.0±0,980	66,7±0,17*	112,3±0,47
Chest depth	31,9±1,900	43,4.0±0,620	30,2±0,20	47,6±0,60**
Chest girth behind the shoulder blades	92,0±3,110	159,7.0±1,450	83,1±1,15	163,5±0,65
Chest width	19,7±1,600	30,6.0±1,570	18,5±0,51	35,4±0,82
Oblique body length	79,6±6,070	114,2.0±1,190	76,2±0,54	115,8±1,93
Quarters width in pin bones	22,3±1,020	39,8.0±0,760	18,9±0,17*	39,8±0,35
Oblique quarters length	22,7±0,260	30,8.0±0,830	21,3±0,55	29,3±0,92
Metacarpus girth	12,8±0,280	17,6.0±0,180	12,2±0,31	17,3±0,10

* p<0,05; ** p<0,01; *** p<0,001 -statistically significant difference between groups

Table 2: Dynamics of the morphological composition of the blood of Aberdeen Angus heifers of Canadian and European selection

Group	Analysis of age (day, month)	Erythrocyte, 1012/l	Haemaglobin, g/l	Leucocyte, 109/l	Lymphocyte, %
I-heifers of Canadian selection	10th day	6.52±0.55	108,3±9,19	7,36±0,63	43,2±4,5
	3rd month	7,12±0,47	115,5±7,78	7,49±0,37	51,5±4,8
	6th month	6,65±0,29	105,7±6,25	7,58±0,14	44,6±3,7
I-heifers of European selection	10th day	5,85±0,38	98,6±9,08	6,23±0,35	40,7±5,3
	3rd month	6,23±0,31	102,3±6,43	6,86±0,44	48,9±5,1
	6th month	6,02±0,47	96,4±3,87	7,04±0,53	40,5±3,8

Table 3: Dynamics of the biochemical composition of the blood of Aberdeen Angus heifers of Canadian and European selection

Group	Exploration period	Crude protein, g/l	Albumins, g/l	Globulins, g/l	Glucose, mol/L	Calcium, mol/L	Phosphorus, mol/L
I-heifers of Canadian selection	10th day	65,2±1,41	34,6±1,58	35,3±1,66	3,21±0,48	3,05±0,18	1,27±0,25
	3rd month	71,5±1,08	35,5±1,93	35,6±2,21	2,32±0,14	2,22±0,11	1,35±0,22
	6th month	77,6±1,22	38,1±2,11	38,9±3,08	2,49±0,26	2,53±0,25	1,54±0,17
I-heifers of European selection	10th day	63,8±1,18	28,2±1,89	35,1±2,16	3,88±0,22	2,78±0,22	1,32±0,26
	3rd month	68,6±1,32	30,3±2,62	35,9±2,48	2,55±0,27	2,17±0,14	1,41±0,23
	6th month	73,2±2,53	32,4±2,18	38,3±2,33	2,87±0,27	2,45±0,24	1,50±0,32

The dynamics of neutrophilic leukocytes in heifers of Canadian selection were characterized by an increase in lymphocytes by 3 months of age 12.3% and a decrease by 6 months of age by 13.4% and in calves of European selection, the number of lymphocytes by 3 months of age was characterized by an increase of 20.1% and a decrease of 6.2 months by 17.2%.

The indicators of the biochemical composition of the blood of Aberdeen Angus heifers of European and Canadian selection have some differences. The level of total protein in animals of the compared groups corresponded to established physiological norms. Throughout the study period, an increase of total protein concentration in the blood of animals of the experimental groups was found, while its content in the blood of heifers of Canadian selection at the age of 10 days, 3 and 6 months was higher by 2.2; 4.2 and 6%, respectively. As a result of the experiment, it was found that the content of globulins significantly prevailed over the level of albumin in the blood of heifers of European and Canadian selection on the 10th day after birth. The subsequent dynamics were characterized by an increase in the concentration of albumin and globulin in the blood of animals of both groups. It should be noted that the level of globulins in 3 and 6 month old heifers of European selection exceeded the level of albumin by 18.5 and 18.2%, respectively.

The concentration and dynamics of glucose in the blood of heifers obtained from cows of Canadian and European selection are one of the most important elements of homeostasis in the blood of animals. The maximum glucose concentration was observed in 10 day old heifers, regardless of their origin. In heifers of Canadian selection, by the age of 3 months, the glucose concentration decreased by 27.7% and at 6 months increased by 28.9%. It should be noted that the level of glucose in the blood of calves obtained from European cows of the second generation exceeded those for heifers of Canadian selection by 20.9; 9.9 and 15.3% in the same period. The blood calcium and phosphorus contents were no differences between the groups.

Conclusion

Based on studies on the adaptive characteristics of livestock, the possibility of breeding beef cattle of the Aberdeen-Angus breed of Canadian origin in the Northern region of Kazakhstan was revealed.

Third generation heifers obtained from cows of Canadian selection were born in the state of physiological maturity by 87.7%, which is 3.7% less than in cows of European selection. The young stock of Canadian selection was characterized by tall growth and broad; European selection compactness.

The growth rate in European calves up to 6 months of age is higher than counterparts of Canadian selection and in the period from 3 to 6 months, calves obtained from cows of the second generation of Canadian selection are superior to calves of European selection.

The established tendency of a lower growth rate of heifers obtained from cows of Canadian selection can be associated with an increase in the tension of regulatory mechanisms that ensure the adaptation of animals to new environmental conditions. Morphological and biochemical blood parameters in young stock obtained from cows of Canadian selection corresponded to the physiological norms.

The acclimatization of heifers of the third generation of Aberdeen Angus in the conditions of the northern region of Kazakhstan is going well, the animals adapted to new conditions of keeping and feeding.

In order to further develop beef cattle breeding and increase beef production in farms of the northern region, it is recommended to use specialized Canadian cattle breeding of the Aberdeen-Angus breed.

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Author's Contributions

Zhanat Titanov: Conceived and planned the study. Revised the manuscript.

Nurlybay Kazhgaliyev: Conceived and planned the study.

Talgat Kulmagambetov and Saltanat Amantay: Conducted lab work and drafted the manuscript.

David Arney: Statistical analysis of data.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and there are no ethical issues involved.

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