

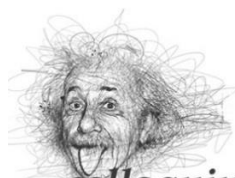
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DOI: [10.24412/2520-6990-2021-17104-16-25](https://doi.org/10.24412/2520-6990-2021-17104-16-25)**ВЛИЯНИЕ ПОРОДНОСТИ НА РОСТ, РАЗВИТИЕ И ПРОДУКТИВНЫЕ КАЧЕСТВА ТЕЛЯТ***Golubenko Tatiana Leonidovna*candidate of agricultural sciences Sciences, Associate Professor
Vinnitsia National Agrarian University, Ukraine**INFLUENCE OF BREEDS ON GROWTH, DEVELOPMENT AND PRODUCTIVE QUALITY OF CALFS****Аннотация.**

Мясная продуктивность животных той или иной породы обусловлена морфологическими и физиологическими особенностями, которые формируются и развиваются под влиянием наследственности и условий внешней среды (кормления и содержания) в период выращивания. В процессе роста и развития животных происходят значительные количественные и качественные изменения, связанные с увеличением массы и изменениями морфологического состава туши. При изучении влияния породной принадлежности на продуктивные качества бычков черно-пестрой породы и абердин-ангус х черно-пестрых помесей, выращенных по технологии молочного скотоводства, установлено, что преимущество по живой массе абердин-ангус х черно-пестрых помесей в возрасте 2 мес. на 6 кг или 8,3% ($P < 0,05$) и в 3 мес. – на 7 кг или 7,3% ($P < 0,05$). Среднесуточные приросты живой массы за весь период опыта от рождения до 6-6,5 мес. были практически одинаковыми – 766 и 755 г. Гетерозис по интенсивности роста у помесных бычков не проявился. Масса парных туш у бычков абердин-ангус х черно-пестрых помесей была на 11,9 кг или 15,9% ($P < 0,05$) выше, чем у сверстников черно-пестрой породы, также как и убойный выход – на 7,8% ($P < 0,001$), который составил 52,5% против 44,7%. У телят контрольной группы и абердин-ангус х черно-пестрых помесей мякотная часть туши (мясо жилованное) составляет около 78%. По коэффициенту мясности (выход мякоти на 1 кг костей) практических различий не установлено, а по показателям жира и протеина, в средней пробе мяса, бычки черно-пестрой породы превосходят своих сверстников на 0,3 и 0,4% соответственно. По химическому составу длиннейшей мышцы спины чистопородные бычки в 6-6,5-месячном возрасте по сравнению с помесным молодняком отличаются повышенным содержанием жира – на 0,6%.

Abstract.

The meat productivity of animals of a particular breed is due to morphological and physiological characteristics that are formed and developed under the influence of heredity and environmental conditions (feeding and maintenance) during the rearing period. In the process of growth and development of animals, significant quantitative and qualitative changes occur, associated with an increase in weight and changes in the morphological composition of the carcass. When studying the influence of breed on the productive qualities of black-and-white bulls and aberdeen angus x black-and-white hybrids raised according to the technology of dairy cattle breeding, it was found that the advantage in live weight of aberdeen angus x black-and-white hybrids at the age of 2 months. on the 6 kg or 8,3% ($P < 0,05$) and at 3 months. - on the 7 kg or 7,3% ($P < 0,05$). Average daily gains in live weight for the entire period of the experiment from birth to 6-6,5 months. were practically the same - 766 and 755 g. Heterosis in terms of growth intensity in crossbred gobies did not appear. The mass of paired carcasses of aberdeen angus gobies x black-and-white hybrids was on 11,9 kg or 15,9% ($P < 0,05$) higher than among peers of the black-and-white breed, as well as the slaughter yield - by 7,8% ($P < 0,001$), which amounted to 52,5% versus 44,7%. In calves of the control group and aberdeen angus x black-and-white hybrids, the flesh of the carcass (trimmed meat) is about 78%. According to the coefficient of meat content (yield of pulp on 1 kg bones), no practical differences have been established, and in terms of fat and protein, in the average sample of meat, black-and-white bulls surpass their peers by 0,3 and 0,4%, respectively. According to the chemical composition of the longest muscle of the back, purebred bulls at the age of 6-6,5 months, compared to hybrid young animals, are distinguished by an increased fat content - by 0,6%.

Ключевые слова: мясная продуктивность, черно-пестрая порода, абердин-ангусские помеси, выход туши, убойный выход, полутуша, морфологический состав, масса внутренних органов.

Keywords: meat productivity, black-and-white breed, aberdeen-angus hybrids, carcass yield, lethal yield, half carcass, morphological composition, mass of internal organs.

Introduction. The meat productivity of animals of a particular breed is due to morphological and physiological characteristics that are formed and developed under the influence of heredity and environmental conditions (feeding and maintenance) during the rearing

period. During the growth and development of animals, there are significant quantitative and qualitative changes associated with an increase in weight and changes in the morphological composition of the carcass [1, 9].

The aberdeen angus breed was developed in the northeastern part of Scotland (County Aberdeen and Angus). Animals of black color, hornless, white spots are allowed on the lower part of the body, near the udder and scrotum. At present, herds of red color have been created. Aberdeen angus cattle on low legs, has well-defined meat forms, is distinguished by a harmonious constitution. The body is deep and round, the neck is short, the loin and the sacrum are well formed, the muscles of the ham descend to the hock joint, the skin is loose, thin and elastic [2, 7].

Among british beef breeds, the aberdeen angus breed has the most pronounced early maturing type: in this respect, only Herefords compete with them. It has an advantage over other meat breeds in a high slaughter yield, reaching in some cases up to 70%, in a high content of pulp in the carcass, a low content of bones and high taste of their meat. Milk productivity of cows 1500-1700 kg for lactation, which is quite sufficient for raising one calf in full suckling up to 7-8 months (live weight at weaning about 200 Kg). Under good grazing conditions, calves under mothers up to 8 months of age add 900-1000 g... Live weight of cows on average 500 kg, some - up to 600 kg, bulls - 700-750, some - 950 kg... aberdeen angus are quite often used in industrial crossing with dairy and meat and dairy breeds. Hybrid crosses inherit hornlessness, black color, high early maturity [4, 5].

Material and methods of research. The rationale for the study of the meat productivity of aberdeen angus

x black-and-white crossbreeds was the fact that in Belarus this very breed began to be used very widely to create herds of beef cattle by crossing producers with non-technological low-productive (milk yield 2-2,5 thousand kg of milk per lactation) by the number of black-and-white dairy cows.

The object of research was the aberdeen-angus calves (1st generation), and black-and-white breeds aged 6-6,5 months, raised according to the technology of dairy cattle breeding. The nutritional value of feed and the technology of keeping animals in different farms had a high degree of identity.

The content of the experimental animals was as follows:

From birth to the age of 6-6.5 months black-and-white young growth (SPK "Batchi" of Kobrin region) and aberdeen angus x black-and-white crossbreeds (private unitary enterprise "Molodovo-Agro" of Ivanovsky region) were raised according to dairy farming technology. Groups of young animals for studying the genotypic characteristics of beef cattle calves and crossbreeds in terms of slaughter indicators, meat productivity and meat quality were formed from the first days of birth. Control slaughter of experimental young animals was carried out at the end of the experiments at meat processing plants: OJSC Kobrin meat-packing plant, OJSC Berezovsky meat-packing plant, KPUP Pinsky meat-packing plant, Brest region. The experimental scheme is shown in Table 1.

Table 1

Experiment scheme

Groups	Breed, breed calves	Floor	Number of goals in a group	Growing technology	Slaughterage, months
1-control	black and white	bulls	10	dairy farming	6-6,5
2-experienced	aberdeen angus x black and white	bulls	10	technology	6-6,5

Scientific research has accumulated a large amount of facts and evidence that the development of an organism and its individual characteristics is always the result of the interaction of the genotype and living conditions. It is not a ready-made trait that is inherited, but a certain type of reaction of a developing organism, or a norm of reaction to environmental conditions. In a changing environment, the same genotype is realized in different ways, since development is controlled by genes that manifest themselves only under certain external factors [10, 11, 13].

The studied groups of gobies were raised according to the technology of dairy cattle breeding. The growing period was subdivided into three phases: preventive, milk and post-milk.

The prophylactic phase lasted 20-30 days. The calves were watered with colostrum, milk, and they began to accustom them to skim milk, hay and concentrates. The average daily gain in live weight was 650-750 g. The milk phase lasted 60-90 days. The calves were given milk, skim milk and their substitutes and gradually accustomed to plant foods - coarse, juicy, green and concentrates. During the first 3 months of life, all plant foods were fed ad libitum. Average daily gain in live weight -800 g... The post-milk phase lasted

60-80 days. Calves were gradually prepared to eat large amounts of voluminous feed. Up to 6-6,5 months of age, 680 units were spent per head in conditions of commercial farms an d80 kg digestible protein. The average daily gain in live weight was 760 g.

In our experiment, the task was set - to study the productive qualities of purebred black-and-white and crossbred aberdeen angus x black-and-white young, and for this the animals were raised under the same conditions of feeding and keeping, i.e. when only the genotype influenced the productive qualities of animals.

Results and discussion. It is known that the growth rate of animals depends on both hereditary qualities and the conditions of keeping and feeding. The quantity and quality of food entering the body determine the nature and intensity of growth and development of young animals [2, 6, 12].

The content of gobies raised according to the technology of dairy cattle breeding was as follows: from birth to 20 days of age, the calves were kept in dispensaries in individual cages, set in rows, between which there was a feed passage. The calves were on a bed of straw, which was changed at the end of the period, and partly changed daily. In the first 20 days of growing, colostrum and milk were fed to calves from individual

teat drinkers: in the first 3-5 days - 4 times a day, then - 3 times at regular intervals. From 20 days of age to 2 months, the calves were kept in individual houses on the street. During the dairy period, the experimental bulls were hand-fed from buckets according to the scheme adopted at the farm. After 2 months of age, the calves were transferred to the nursery at the complex.

Consequently, such young animals have good health, consume more voluminous feed during the rearing period and give a satisfactory increase in live weight without large expenditure of concentrates.

Indicators of consumption and structure of feed in bulls of different genotypes from birth to 6-6,5 months of age are presented in Table 2.

Table 2

Consumption and structure of feed for black-and-white bulls and aberdeen angus x black and white cross-breeds from birth to 6-6.5 months

Name of feed	Black and white breed (control) (n = 10)		Aberdeen angus x black-and-white hybrids (n = 10)	
	feed consumption, kg	feed structure, %	feed consumption, kg	feed structure, %
Whole milk	220	9,0	220	9,1
Fresh return	400	7,1	400	7,1
Meadow hay herbal	185	13,9	185	13,9
Grain haylage	525	28,5	520	28,3
Pasture grass	-	-	-	-
Concentrates	283	41,5	283	41,6
Feed units total, kg	681,2	-	679,4	-
Digestible total protein, kg	79,3	-	79,1	-
It falls on 1 class. digestible protein, g	108	-	108	-

The results of the analysis of this table showed that the animals of the studied groups for the period from birth to 6-6,5 months of age consumed on average per one head of feed with a total nutritional value of 679-681, where 1 c.u. had to 108 g digestible protein.

In the structure of diets of calves of both groups raised according to the technology of dairy cattle breeding, roughage made up 42%, concentrates - 41%, milk - 9%, return - 7%.

Knowledge of the individual development of an organism is necessary, first of all, because in the process of growth and development, an animal acquires not only natural and species characteristics, but also peculiarities of its constitution, exterior, and productivity inherent only to it. The system of intensive raising of bull calves for meat should be based on knowledge of the processes of formation of meat productivity, the patterns of growth and development of animals.

The individual development of an animal organism is carried out through closely interrelated quantitative and qualitative transformations. Moreover, the quantitative aspect of ontogenesis is the growth of an organism without significant changes in its physiological and morphological properties. The qualitative aspect of ontogenesis is development itself - the emergence of qualitatively new cells and tissues. Although growth and development are not identical concepts, they are inextricably linked [1, 3].

One of the main criteria characterizing the growth and development of animals is the indicator of their live weight in certain age periods. In the aspect of the research, the dynamics of changes in the live weight of experimental calves of different genotypes in the process of their individual development was studied (Table 3).

Table 3

Dynamics of live weight of experimental bulls, kg

Breed and breed	Age, months							Feed costs, units on the 1 kg gain
	2-3 days	1	2	3	4	5	6-6,5	
black and motley (n = 10) (control)	thirty ± 1,1	fifty ± 1,5	72 ± 2,1	96 ± 2,2	120 ± 2,9	145 ± 3,3	174 ± 3,9	4,7
aberdeen angus x black and white (n = 10)	28 ± 0,8	52 ± 1,4	78 ± 2,3	103* ± 2,7	124 ± 3,3	144 ± 3,7	170 ± 4,0	4,8

Note: hereinafter - * P <0,05; ** P <0,01; *** P <0,001

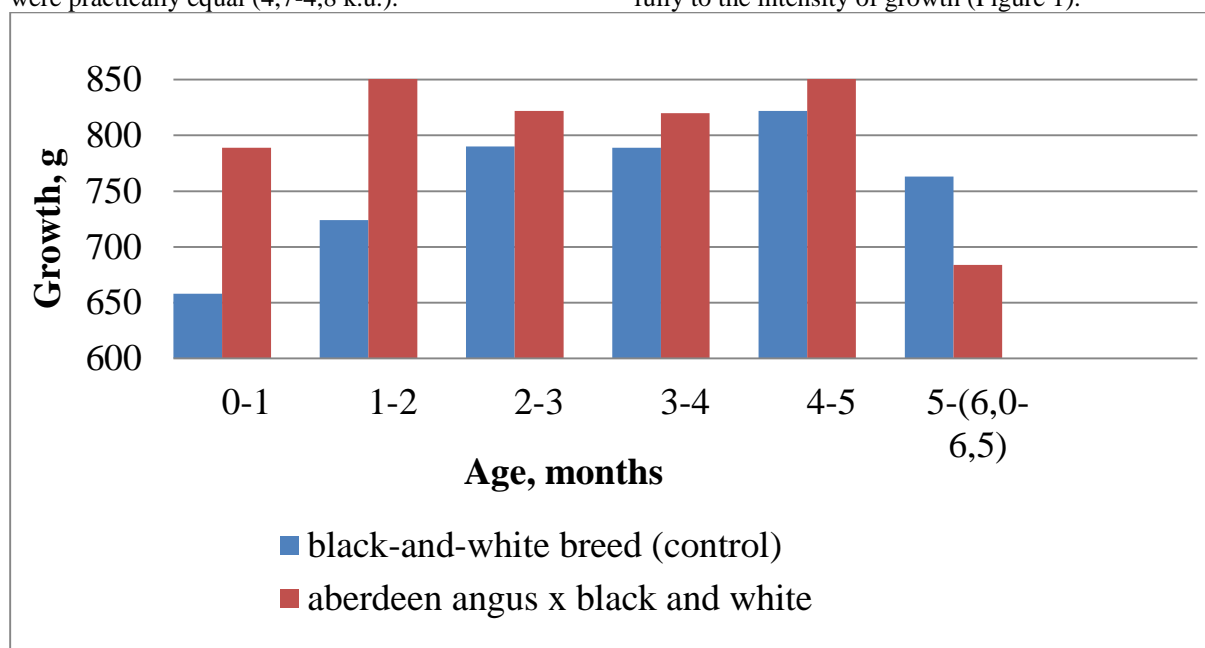
Live weight at birth in black-and-white bulls was 30 kg, what's on 2 kg or 7% more than aberdeen angus x black-and-white hybrids. At the age of three months in live weight, the superiority was on the side of the crossbred bulls, and the difference was 7 kg or 7,3% (P <0,05), however, by the end of the experiment, the live

weight was already insignificant, but higher - by 4 kg or 2,4% in favor of purebred bulls.

The efficiency of the use of feed by animals for growth and development is of great economic importance, especially in beef cattle breeding, where feed

accounts for up to 70% of the cost of production. Analysis of feed consumption per 1 kg the increase in live weight of gobies showed that feed costs for both groups were practically equal (4,7-4,8 k.u.).

However, according to the absolute indicators of live weight, it is difficult to judge the nature of the growth of animals. Average daily gains testify more fully to the intensity of growth (Figure 1).



Picture 1. Average daily gain in live weight of experimental animals at different age periods, g

According to this graph, we can conclude that from birth to 5 months of age, the advantage was on the side of the aberdeen angus x black-and-white hybrids: in the first month - by 131 g or 20%, in the second - by 131 g or 18%, in the fourth - by 31 g or 4%, in the fifth - by 33 g or 4%. However, this indicator at the end of cultivation at the age of 5- (6,0-6,5) months on the 79 g or 11.5% was higher in black-and-white bulls.

Average daily gains in live weight for the entire period of the experiment from birth to 6-6.5 months were practically the same - 766 and 755.

When studying the productive qualities of aberdeen-angus hybrids, the same-aged black-and-white bulls were selected as a control group for comparison. It is known that the meat productivity of animals is determined by the quantity and quality of products obtained after slaughter. In order to study the meat

productivity of black-and-white bulls and aberdeen angus x black-and-white crosses, a control slaughter was carried out at 6-6.5 months, 6 heads from each group. The indicators characterizing the meat productivity of livestock include: live weight, carcass weight (meat on bones), internal raw fat, morphological composition of the carcass, the ratio in the carcass of individual cuts by varieties, chemical composition and quality indicators of meat, slaughter weight, slaughter yield.

As a result of the control slaughter, high indicators were established that characterize the meat productivity of the experimental gobies. The pre-slaughter body weight of black-and-white bulls was 168,2 kg, aberdeen angus x black and white crossbreeds – 165,8 kg and reflected the average indicators of the groups (table 4).

Table 4

Indicators of the control slaughter of black-and-white bulls and aberdeen angus x black-and-white crosses at the age of 6-6,5 months.

Indicators	Black and white breed (control) (n = 6)	Aberdeen angus x black and white Hybrids (n = 6)	d_{x2-x1}	t
	$X_1 \pm S_x$	$X_2 \pm S_x$		
Pre-slaughter live weight, kg	168,2 ± 2,79	165,8 ± 11,78	- 2,4	0,19
Steam carcass weight, kg	74,8 ± 1,94	86,7 ± 6,81	11,9	0,71
Carcass yield, %	44,5 ± 1,01	52,2 ± 0,61 ***	7,7	6,55
Internal fat mass, kg	0,4±0,03	0,5 ± 0,08	0,1	1,52
Internal fat yield, %	0,2 ± 0,02	0,3 ± 0,04 *	0,1	2,68
Slaughter weight, kg	75,2 ± 1,95	87,3 ± 6,86	12,1	1,69
Lethal output, %	44,7 ± 1,01	52,5 ± 0,61 ***	7,8	6,64

According to the table, the mass of the paired carcass of the aberdeen angus gobies x black-and-white hybrids was 11,9 kg(15.9%) higher than that of black-and-white bulls. In the carcasses of gobies of the control group, 0,1 kg or 25% contained less internal fat, and the difference in internal fat yield was 0,1% in favor of aberdeen-angus crosses.

In addition to the absolute indicators of the mass of carcasses, fat and other slaughter products, the level of meat productivity is also characterized by the slaughter yield, which is determined by the ratio of the slaughter mass of the carcass and raw fat to the pre-slaughter weight of the animal, expressed as a percentage.

In our experiment, the slaughter yield was 7,8% higher in crossbred beef bulls and amounted to 52,5% ($P < 0,001$) versus 44,7%. Also aberdeen angus x black-and-white hybrids were 7,7% ($P < 0,001$) superior in carcass yield.

Thus, it should be noted that aberdeen angus x black-and-white crosses had a higher meat yield with a relatively low fat content in the carcass compared to the control group of black-and-white bulls.

It is known that meat breeds of cattle have a higher maturity and meat content in comparison with other breeds of cattle. Their meat is more tender, juicier, nutritious and has excellent taste. One of the main objects

for assessing the meat productivity of livestock is the carcass obtained after the slaughter of the animal. The nutritional value of meat carcasses is determined, as is known, by the ratio of muscle, adipose, connective and bone tissues included in their composition. Muscle tissue is the most valuable part of the carcass, its amount, depending on various factors (fatness, age, genetic basis), varies, according to the literature, from 50 to 64%. The higher the fatness, the less muscle tissue is contained in the total ratio of the constituent parts of meat and the more fat. In the carcasses of the young well-raised animals trimmed meat contains 77-80%. Adipose tissue is a connective stroma that contains fat cells. The fat content in the carcass is from 2%. Connective tissue consists of ligaments, capsules, tendons, layers between muscles, fascia, etc. Bones are a type of connective tissue. In the carcass of cattle, the bone content ranges from 13 to 22% [1, 3, 8].

In our experience, the deboning of the left half carcasses showed that in black-and-white bulls and aberdeen angus x black-and-white crosses, the flesh of the carcass (trimmed meat) is within 78%, which corresponds to a high level of production during its processing (table 5).

Table 5

Morphological composition of half carcasses black-and-white bulls and aberdeen-angus x black-and-white hybrids at the age of 6-6.5 months.

Indicators	Black and white breed (control) (n = 6)	Aberdeen angus x black and white crossbreeds (n = 6)	$d_{x_2-x_1}$	t
	$X_1 \pm S_x$	$X_2 \pm S_x$		
Chilled half carcass weight, kg	36,2±0,99	41,2±3,27	5,0	1,46
including pulp, kg	28,3±0,91	32,1±2,89	3,8	1,25
bones and tendons, kg	7,9±0,23	9,1±0,59	1,2	1,88
Contained in half carcass,%: pulp	78,2	77,9	- 0,3	-
bones and tendons	21,8	22,1	0,3	-
Meat factor	3,6	3,5	- 0,1	-

According to the content of the pulp in the carcasses, the nutritional and commercial qualities of the meat are determined. In our experience, half carcasses of aberdeen angus gobies x black-and-white crosses contained more meat pulp by 3.8 kg (13,4%) than in the half carcasses of the control group. At the same time, the relative content of pulp was 0,3% higher in the carcasses of black-and-white bulls. Flesh factor (pulp yield per 1 kg bones) by 2,9% was slightly higher in dairy gobies.

Objectively, the meat productivity can be judged by the results of deboning of animal carcasses. The growth of muscle tissue, like the skeleton, is uneven. The musculature of the peripheral skeleton finishes the growth faster, and the musculature of the axial skeleton has a longer period of growth. Consequently, with age, changes occur in the ratio of muscle and bone tissues in

different parts of the animal's body, which affects the nutritional value of meat during its further processing [13].

Therefore, we studied the ratios of the natural anatomical parts of the left half carcasses of black-and-white bulls and aberdeen angus x black-and-white hybrids at the age of 6-6,5 months with their preliminary cutting into five natural anatomical parts: cervical - along the last cervical vertebra; the scapula - along the contour of the scapula from the ulnar tubercle in a straight line to the upper corner of the scapula, the muscles connecting the scapula with the thoracic part are incised, and the muscles lying along the upper and anterior edges of the scapula; spinal rib with brisket - along the last rib; lumbar with flank - along the last lumbar vertebra; hip with two caudal vertebrae (Figure 2).

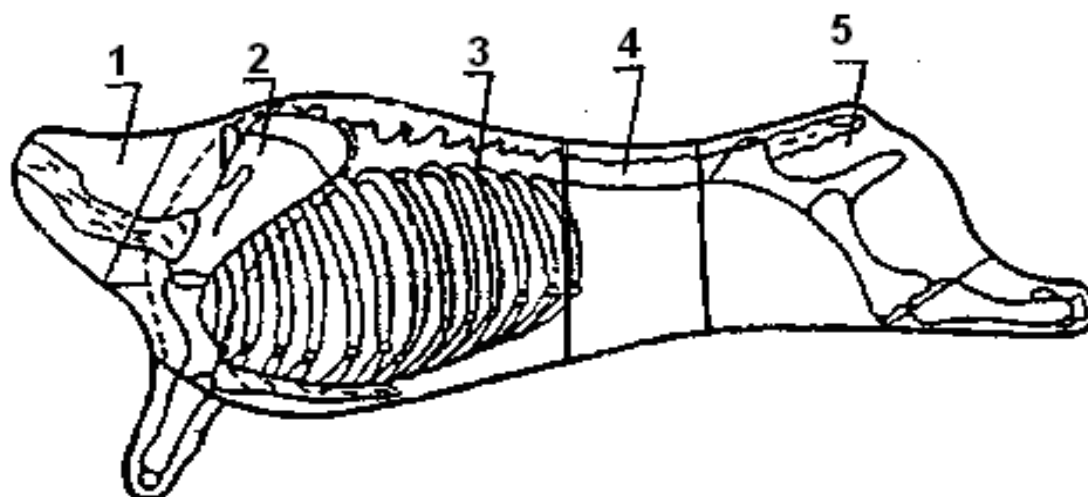


Figure 2. Diagram of cutting half-carasses of calves into natural-anatomical parts
1 - cervical; 2 - scapular; 3 - spinal rib; 4 - lumbar; 5 - hip

Table 6 shows the ratio of the natural anatomical parts of the carcasses of dairy and meat gobies. It is known that in terms of nutrition, individual parts of the carcass are unequal. The highest nutritional value is

possessed by the hip, lumbar (without flank) and dorsal parts of the carcass, from which such cuts as sirloin, rump, rump and rump are obtained.

Table 6
The ratio of the natural anatomical parts of the carcasses of black-and-white bulls and Aberdeen Angus x black-and-white crosses

The name of the anatomical parts	Black and motley breed (control) (n = 6)		Aberdeen angus x black and white Hybrids (n = 6)		d _{x2-x1}	t
	X ₁ ± S _x	%	X ₂ ± S _x	%		
Half carcass	36,2±0,99	100	41,2±3,27	100	5,0	1,46
Cervical	3,3±0,10	9,2	3,8±0,40	9,2	0,5	0,57
Scapula	6,7±0,31	18,5	7,8±0,60	18,9	1,1	1,70
Dorsal	9,1±0,23	25,1	9,8±0,74	23,8	0,7	0,90
Lumbar	3,2±0,14	8,8	3,6±0,33	8,7	0,4	1,39
Hip	13,9±0,52	38,4	16,3±1,93	39,5	2,4	1,21

It is important to note that in all respects the advantage was on the side of the crossbred bulls. So, according to the mass of the lumbar part of the carcass – by 0,4 kg or by 12,5%, on the hip part - by 2,4 kg or 17,3% were superior to their peers. The superiority of the carcasses was also manifested in the neck cut – on 0,5 kg or 15,2%, on the spinal-costal - by 7,7% and on the shoulder-scapular part - by 1,1 kg or 16,4%.

All this suggests that carcasses obtained from aberdeen angus gobies x black-and-white crossbreeds are

more profitable for processing, since they contain more edible part than in carcasses obtained from black-and-white gobies.

The merits of meat animals are largely determined by the ratio of the weight of the meat to the weight of the bones in the carcass. It should be noted that certain differences were revealed in the yield of individual cuts in gobies, depending on their breed (table 7).

Table 7
Output of pulp on 1 kg bones in separate natural-anatomical parts of carcasses of black-and-white bulls and aberdeen-angus x black-and-white crosses at the age of 6-6,5 months.

Name of anatomical parts	Black and motley breed (control) (n = 6)		Aberdeen angus x black and white hybrids (n = 6)		d _{x2-x1}	t
	X ₁ ± S _x	%	X ₂ ± S _x	%		
Half carcass	3,6 ± 0,15	78,2	3,5 ± 0,23	77,9	- 0,1	0,22
Cervical	3,5 ± 0,10	77,7	3,7 ± 0,39	77,1	0,2	0,55
Scapula	2,8 ± 0,10	73,2	3,0 ± 0,06	74,7	0,2	1,63
Dorsal	3,4 ± 0,06	76,9	2,5 ± 0,15***	71,1	- 0,9	5,20
Lumbar	4,6 ± 0,09	82,0	6,4 ± 0,32***	85,2	1,8	5,26
Hip	4,2 ± 0,50	80,2	4,5 ± 0,62	81,6	0,3	0,30

By the exit of the pulp on 1 kg bones in the most culinary valuable parts, hip and lumbar, there were some differences between the groups. So, on the hip part – on 0,3 kg or 7,1%, and on the lumbar part - by 1,8 kg or 39,1% ($P < 0,001$) beef gobies were preferred. In terms of the yield of pulp in the cervical and shoulder-scapular parts, an advantage was also observed in aberdeen angus gobies and black-and-white hybrids, and the difference was 5,7% and 7,1%, respectively. The superiority of black-and-white gobies was in the mass of the spinal-rib cut – by 0,9 kg or 36% ($P < 0,001$).

In our experiment, meat samples were taken for chemical analysis as follows. The meat, separated from the bones (boneless), was subjected to trimming with the removal of tendons, cartilage, superficial and inter-muscular fat, then the trimmed meat was passed through a top. The resulting minced meat was thoroughly mixed and an average sample weighing 0,5 kg. Chemical composition of the average sample of meat-black-and-white gobies and aberdeen angus x black-and-white hybrids raised according to the technology of dairy cattle breeding are presented in table 8.

Table 8

Chemical composition of the average meat sample of black-and-white bulls and aberdeen angus x black-and-white crosses at the age of 6-6,5 months.

Indicators	Black and white breed (control) (n = 6)	Aberdeen angus x black and white crossbreeds (n = 6)	d_{x2-x1}	t
	$X_1 \pm S_x$	$X_2 \pm S_x$		
The average meat sample contained, %: water	74,7±0,87	75,5±0,46	0,8	0,77
fat	5,4±0,36	5,1±0,38	- 0,3	0,65
ash	0,7±0,046	0,7±0,02	0,0	0,00
protein	19,1±0,63	18,7±0,33	- 0,4	0,53
dry matter	25,3±0,87	24,5±0,46	- 0,8	0,77

As can be seen from the data in the table, in the meat of aberdeen angus gobies x black-and-white crosses, a higher water content is noted by 0,8% compared to gobies of the control group. For all other indicators of the chemical composition of meat, black-and-white bulls slightly surpass their peers. So, in terms of

fat content in the average sample of meat - by 0,3%, in protein - by 0,4%, dry matter - by 0,8%, and in the amount of ash the indicators are equal.

Data obtained on the chemical composition of internal fatcalves of the black-and-white breed and aberdeen-angus hybrids are presented in table 9.

Table 9

Chemical composition of internal fat in black-and-white bulls and aberdeen angus x black-and-white hybrids at the age of 6-6,5 months.

Indicators	Black and white breed (control) (n = 6)	Aberdeen angus x black and white crossbreeds (n = 6)	d_{x2-x1}	t
	$X_1 \pm S_x$	$X_2 \pm S_x$		
The average sample contained fat, %: water	27,1±2,89	26,8±2,59	- 0,3	0,08
fat	68,8±3,03	70,8±2,59	2,0	0,50
ash	0,09±0,002	0,07±0,003***	- 0,02	25,0
protein	4,0±0,46	2,4±0,12**	- 1,6	3,45
dry matter	72,9±2,92	73,2±2,40	0,3	0,08

It was found that the greatest amount of water and protein was contained in the fat of black-and-white bulls, this fact indicates a slightly lower calorie content.

So, in the internal fat of gobies of the control group, water contained 27,1% and protein 4% ($P < 0,01$), which was 0,3% and 1,6% higher compared to hybrid animals, respectively. At the same time, in terms of the amount of fat in the internal fat, crossbred bulls

with an indicator of 70,8% were 2% higher than pure-bred bulls.

In our experience, it should be noted that the indicators of the chemical composition of the longest muscle of the back of animals of both groups basically confirmed the trends obtained in the analysis of samples of the average sample of meat (table 10).

Table 10

The chemical composition of the longest dorsi muscle in black-and-white bulls and aberdeen angus x black-and-white hybrids at the age of 6-6,5 months.

Indicators	Black and motley breed (control) (n = 6)	Aberdeen angus x black and white crossbreeds (n = 6)	d_{x2-x1}	t
	$X_1 \pm S_x$	$X_2 \pm S_x$		
The average meat sample contained, %: water	76,7±0,38	77,7±0,2*	1,0	2,33
fat	2,8±0,14	2,2±0,18*	- 0,6	2,41
ash	0,7±0,04	0,8±0,02	0,1	2,24
protein	19,7±0,29	19,3±0,08	- 0,4	1,53
dry matter	23,3±0,38	22,3±0,2*	- 1,0	2,33

In terms of chemical composition, the longest muscle of the back of purebred bulls at 6-6,5 months of age, in comparison with hybrid young animals, is characterized by an increased fat content - by 0,6% ($P < 0,05$). In terms of water and ash content, aberdeen angus gobies x black-and-white hybrids were higher than

their black-and-white peers by 1% ($p < 0,05$) and 0,1%, respectively.

The quality indicators of the meat of the experimental gobies are presented in table 11.

Table 11

Qualitative indicators of meat of black-and-white bulls and aberdeen angus x black-and-white crosses at the age of 6-6,5 months.

Indicators	Black and white breed (control) (n = 6)	Aberdeen angus x black and white crossbreeds (n = 6)	d_{x2-x1}	t
	$X_1 \pm S_x$	$X_2 \pm S_x$		
Active reaction of the medium, pH	6,1±0,03	6,0±0,02**	- 0,1	4,34
Color intensity (extinction coefficient x 1000)	180,2±2,67	192,8±3,44*	12,6	2,91
The amount of bound water, % moisture retention	52,8±0,64	52,9±0,59	0,1	0,01
Digestibility, %	38,5±0,84	38,1±0,61	- 0,4	0,41

In our experiment, the pH values 48 hours after slaughter of the experimental gobies were at the level of 6-6,1 ($P < 0,01$). This means that the meat of gobies of the studied genotypes had an acidic environment, which plays an important role in the storage of the product. The color of the meat is a very important organoleptic characteristic and is mainly due to the content of myoglobin and its derivatives. With a high content of oxymyoglobin, the meat is characterized by an intense bright red color; with an increased level of metmyoglobin, it becomes dark red. The meat of young animals, especially heifers, is usually light red, and of gobies it is dark red [1, 11, 13].

Meat aberdeen angus gobies x black-and-white hybrids had a more intense coloration and better presentation. Their muscle tissue chromaticity index was 7% ($P < 0,05$) higher than that of black-and-white bulls. The technological properties of meat are characterized by water-holding capacity. Water in meat is present in free water, which can be removed by drying, and in bound states. The first, being a solvent of organic and inorganic compounds, participates in all biochemical processes occurring during the storage and processing of raw meat.

Moisture capacity is determined by the presence of bound water as a percentage of the mass of meat. In our studies, this indicator for the experimental bulls was the same - at the level of 52,9%.

The digestibility of the meat of crossbred bull calves was slightly (by 0,4%) lower than that of purebred bulls. The vital activity of an animal, as well as the level of its productivity, is mainly determined by the development of internal organs and their functional activity, since all metabolic processes occurring in the animal's body are associated with the development of these organs. By the development of internal organs, one can judge the intensity of the metabolic processes occurring in the animal's body, on which, ultimately, the vital activity of the organism and the level of its productivity depend.

By-products differ markedly in morphological and chemical composition, so they are not equivalent in nutritional value. Thus, the internal organs that do not perform motor functions during the life of the animal (liver, lungs, kidneys, spleen, etc.), consist of parenchymal and connective tissues with a large number of blood and lymphatic vessels. The heart, tongue, diaphragm and stomach are made up of muscle, connective and glandular tissue [13].

In order to study the development of internal organs during the slaughter of calves, the weights of the heart, liver, kidneys, lungs and spleen were taken into account separately. Comparison of indicators of the mass of internal organs was carried out in absolute values, expressed in kg, and relative (as a percentage of the mass of individual organs to the pre-slaughter weight of the animal) at 6-6.5 months of age (table 12).

Absolute and relative mass of internal organs black-and-white bulls and aberdeen angus x black-and-white crossbreeds

Name anatomical parts	Black and motley breed (control) (n = 6)		Aberdeen angus x black and white hybrids (n = 6)		d _{x2-x1}	t
	X ₁ ± S _x	%	X ₂ ± S _x	%		
Pre-slaughter live weight, kg	168,2±2,79	2,86	165,8±11,8	3,14	- 2,4	0,19
Internal organ mass:						
heart, kg	0,8±0,03	0,48	0,7±0,05	0,42	- 0,1	1,54
lungs, kg	1,2±0,03	0,71	1,6±0,20	0,97	0,4	1,98
liver, kg	1,8±0,13	1,07	2,0±0,10	1,21	0,2	0,18
kidneys, kg	0,7±0,04	0,42	0,6±0,02*	0,36	- 0,1	2,68
spleen, kg	0,3±0,02	0,18	0,3±0,03	0,18	0,0	0,00

Analysis of the data in the table showed that with a heart mass – 0,8 kg, kidneys – 0,7 kg (P <0,05) in purebred animals, the difference was 14,3% and 16,7%, respectively, in favor of the gobies of the control group compared with the crossbred gobies. However, in terms of the mass of the lungs and liver, the superiority of 0,4 kg or 33,3% and 0,2 kg or 11,1%, respectively, had Aberdeen Angus x Black-and-White Hybrid Compared to Purebred Gobies. Consequently, the relative mass of internal organs in black-and-white animals was higher, with the exception of the mass of the lungs and liver, in comparison with hybrid gobies.

Thus, the nature of the differences in the mass of some internal organs between the experimental animals, both in absolute and in relative terms, gives us reason to assume that the functional activity of the main life support systems of the organism in the compared groups of gobies has certain features.

Conclusions. When studying the influence of breed on the productive qualities of black-and-white bulls and aberdeen angus x black-and-white crosses grown using the technology of dairy cattle breeding, it was found:

- advantage in live weight of aberdeen angus x black-and-white hybrids at the age of 2 months on the 6 kg or 8,3% (P<0,05) and at 3 months. - on the 7 kg or 7,3% (P<0,05). Average daily gains in live weight for the entire period of the experiment from birth to 6-6,5 months were practically the same - 766 and 755 g. Heterosis in terms of growth intensity in crossbred bulls did not appear;

- the mass of paired carcasses of aberdeen angus gobies x black-and-white hybrids was on 11,9 kg or 15,9% (P<0,05) higher than among peers of the black-and-white breed, as well as the slaughter yield - by 7,8% (P<0,001), which amounted to 52,5% versus 44,7%;

- in calves of the control group and aberdeen angus x black-and-white hybrids, the flesh of the carcass (trimmed meat) is about 78%. According to the coefficient of meat content (yield of pulp on 1 kg bones), no practical differences have been established, and in terms of fat and protein, in the average sample of meat, black-and-white bulls surpass their peers by 0,3 and 0,4%, respectively;

- according to the chemical composition of the longest muscle of the back, purebred bulls at 6-6,5 months of age, compared to hybrid young animals, have an increased fat content - by 0,6%;

- pH values of meat 48 hours after slaughter of experimental gobies were at the level of 6-6,1 (P <0,01). The meat of aberdeen angus gobies x black-and-white crossbreeds was more intensely colored and had a better presentation. Their muscle tissue chromaticity index is 7% (P <0,05) higher than that of black-and-white bulls;

- with a heart mass – 0,8 kg, kidneys – 0,7 kg (P <0,05) in purebred animals, the difference was 14,3% and 16,7%, respectively, in favor of the bulls of the control group compared to the crossbred bulls. However, in terms of the mass of the lungs and liver, the superiority of 0,4 kg or 33,3% and 0,2 kg or 11,1%, respectively, had aberdeen angus x black-and-white hybrid compared to purebred gobies.

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