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## Peculiar Properties Of Growth And Meat Efficiency Of Bull-Calves Of The French Breeding In The Central Black Earth Zone.

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### ABSTRACT

The article presents the comparative evaluation of growth, meat productivity and economic efficiency of bull-calves of Limousin, Abraxas, Salerskaya and Charolais breeds of French selection and Simmental peers with their intensive breeding for meat to 19.5 months with year-round loose stall content. At this age, the bulls of the Charolais breed reached live weight of 603.9 kg and were superior to the Limousin peers at 73.4 kg and 14.4% , Abraxas – 37.7 kg and 6.6%, Salers – 64.4 and 11.9% and Simmental – 47.3 kg and 10.8%. The animals of the Limousin breed were characterized by the least intensity of growth, which is obviously due to their lower acclimatization abilities in specific conditions. Indicators of the growth intensity of bulls, the yield of carcasses and its edible part, the ratio of basic nutrients and their ratio, quality indicators and biological value of muscle tissue indicate the advantage of animals of meat breeds of French selection compared with Simmentals. Final conclusions about the feasibility of breeding cattle of Limousine breed can be made on the basis of additional research. Economic assessment of bull-calves cultivation indicates the level of profitability in their implementation for meat at the age of 19.5 months in the range of 10.0 to 12.0%, and for breeding purposes – 30.40%.

**Keywords:** meat breeds, French selection, bulls, growth, meat productivity.

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## INTRODUCTION

Currently, the main source of beef production in most regions of Russia is animals of dairy and combined breeds of cattle. At the same time, an important reserve for increasing meat resources is specialized meat cattle breeding, which is based mainly on the breeding of domestic breeds of cattle – Kazakh white-headed and Kalmyk, which, along with high meat productivity and adaptive plasticity, are characterized by intensive fat deposition at a young age [1,3,5,6,]. It is not by chance that in many countries preference is given to Franco-Italian meat breeds, young growth of which is characterized by high adaptive plasticity and desirable ratio of fat and protein in meat [10,11].

The country has a variety of natural and climatic conditions. Therefore, it is difficult to imagine a breed or type of cattle, which animals are well adapted to contrasting environmental conditions. However, the complexity of breeding animals of foreign selection is poor acclimatization abilities of some breeds in some regions of the country [8].

In recent years, in order to form highly productive dairy and meat herds in the farms of the Central Black Earth region import different breeds of cattle of dairy combined and meat areas of productivity.

At the same time, with the growth of milk production of cows, there is a further decrease in the number of dairy cattle, which led to a decrease in the meat contingent.

In this regard, the only solution to the problem of increasing beef production is the intensification of its production.

Each breed has its own economically useful features, which are implemented to the maximum extent in certain environmental conditions. In this regard, it is possible and appropriate to identify the most promising breeds of cattle for breeding in a particular zone, in order to use them rationally for the production of high-quality beef and heavy leather raw materials. However, some researchers prefer interbreeding (17,22).

According to the aggregate indicators, high efficiency in the production of beef in areas of intensive farming is obtained from young animals grown for meat, with an average daily increase in the range of 1000-1100 g [1]. In this regard, a significant scientific and practical interest is a comparative assessment of the growth, development and meat productivity of bull-calves of meat breeds of French selection, as well as Simmental peers of the local population with intensive technologies of beef production in the Central Black Earth region. However, in the area of the Central Region of Russia the growth characteristics and meat quality of animals of French selection breeds is practically not studied [2,9,12], as previously animals of Abraxas and Salers breeds have not been imported in the farms in Russia, like Limousin and Charolais breeds in the farms of the Central Black Earth region.

## PURPOSE AND OBJECTIVES

The purpose of the research was to make a comparative assessment of the growth, development of interior features, meat productivity, meat quality and economic efficiency of growing bulls-calves of meat breed cattle of French selection and domestic Simmentals with their intensive cultivation for meat up to 19.5 months.

To solve the problem, the tasks were set to study in the comparative aspect the features of weight and linear growth of bulls, some interior indicators, and features of meat productivity, meat quality and economic efficiency of beef production

## METHODS AND MATERIALS

The object of the research was bulls-calves of Limousin, Abraxas, Salerskaya, Charolais and Simmental breeds from birth to 19.5 months.

The experimental part of the work was performed on the elevator of JSC “Belgorodskoe” on breeding work” Belgorod region. For research and economic experience in the farms five groups of 12 newborn calves in

each were selected, the first (I) from which is presented by the animals of Limousin, II - Abraxas, III – Salers, IV – Charolais and V – Simmental breeds. The latter served as a control one. Bulls of meat breeds were up to 7 months on the suckling maintenance, and Simmental peers were grown on the technology adopted in dairy cattle breeding. Further to 19.5 months animals of all breeds were in loose all year round housing with free access to feed and water in the light type room.

The weight growth of bulls was studied by the results of monthly weighing, on the basis of which the absolute and average daily growth was calculated. Meat productivity was determined by the results of slaughter of 3 bulls from each group aged 15.5 and 19.5 months. The analytical laboratory determined the chemical composition of the flesh part of the carcass and the longest back muscle.

The economic efficiency of growing bulls of different breeds was calculated based on the results of the existing costs and revenues from their implementation.

**RESULTS**

The task of the research was to study in the comparative aspect the productive and meat qualities of bulls of French meat breeds and Simmental peers in their cultivation up to 19, 5 months. During this period, the bulls consumed 34.2-4045.1 kg of feed units, each of which accounted for 113.1-114.9 g of digestible protein. In the structure of consumed feed, fodder occupied 40.2-46.9%. The maximum amount of feed according to their overall nutritional value was consumed by animals of the Simmental and Charolais breeds and the smallest – by Limousin that we associate with certain difficulties, due to the problem of the acclimatization of animals of this genotype in comparison with peers of other species in the new environment.

At cultivation of young animals, except molasses, a forage of own production was used. In the structure concentrated ones were in the privileged position (table1).

Bulls simmetals were grown to 6 months on the technology of dairy cattle, where in addition to feeding with hay and silage, they received milk and skim milk in the future age period, animals of all breeds were in the same group with year-round loose maintenance.

**Table 1: The structure of the feed consumed by the bulls for a 19.5-month period,%**

Feed	Breed				
	Limousine	Abraxas	Salers	Charolais	Simmental
Milk	10,6	10,8	10,7	9,3	2,3
Skim milk	-	-	-	-	2,,1
Hay	24,5	23,7	25,0	27,3	26,2
Silage	14,5	15,7	11,9	18,2	17,5
Green mass	4,3	4,8	4,8	4,4	4,9
Concentrated feed	45,4	44,3	46,9	40,2	46,3
Molasses	0,7	0,7	0,7	0,6	0,7
Total	100,0	100,0	100,0	100,0	100,0

Indicators of live weight and external forms of an animal are functions of its growth and development. These features determine the value of meat productivity, the indicators of which is directly proportional to the increase in live weight.

It is believed that the growth refers only to those processes in which the mass of tissues and organs, linear and volumetric size of the animal increase.

The development of the organism consists in the formation of qualitatively new tissues and restructuring of physiological processes in the animal’s body with its age [10].

Breed affiliation largely determines the nature of growth and development of young animals and has an impact on the level of its meat productivity.

Methods of studying the growth and development of animals are diverse. The main of them are carried out by determining the live weight, its daily growth and linear measurements. Evaluation of animals for the amount of linear measurements and physique indexes showed to advantage of meat forms of the young Limousin, Charolais and Abraxas breeds. Less desirable these signs are noted in Simmentals and Salers peers. With age, the young of all breeds well-developed chest, back and waist were formed.

The level of meat productivity of young cattle, the quality and nutritional value of beef is largely determined by the amount of live weight of the grown young for meat. However, genetic and environmental factors have a significant impact on these characteristics. The animals are differed by a proportional body, good bone and hoof horn, excellent muscularity of rear third of the body. It was found that at the age of 8 months the bulls of the Saler breed exceeded the peers of the Limousin breed by 6.8 cm and 6.9% ( $P>0.99$ ) in the height measurement at the withers, respectively, Abraxas – by 5.3 cm and 4.5 % ( $P>0.99$ ), Charolais – by 7.7 cm and 7.8% and Simmental – by 2.3 cm and 6.3% ( $P>0.95$ ). It is characteristic that in future ages the advantage in the value of this feature remained for the animals of the Salers breed. It is known that Salers for a long period in France were animals of double direction of productivity, which influenced the formation of meat animals of tall type. Comparing the indicators of absolute values of linear measurements, it was found that by the age of 15 months in animals of all breeds meat forms were well expressed, especially the rear third of the body. They were characterized by proportional physique, excellent musculature and other characteristic features for meat-type animals.

Important interior features associated with the general level of metabolism and the intensity of physiological processes in the body are the indicators of morphological and biochemical composition of the blood of bulls in connection with their breed and age.

It was found that the age variability of blood morphological parameters, due to the breed and age of animals, did not go beyond the physiological norm, and their differences were statistically unreliable. An increase in the total protein content in the blood serum of bulls of all groups due to their age was revealed.

In animals there was a tendency to increase the content of alpha and beta globulins in the total serum protein, which we associate with an increase in the intensity of growth of bulls of all breeds from 8 months. It required a certain tension of physiological functions of the organism of intensively growing young animals.

Biochemical analysis of blood serum showed that the content of calcium and phosphorus, and the ratio between them did not go beyond the physiological norm. However, attention is drawn to the low content of carotene in the blood of animals of all groups, which is probably due to its relatively low content in feed.

From the data presented in table 2, it follows that the greatest live weight newborn bulls of the Charolais breed are differed, which surpassed the peers of group I by 1.1 kg and 3.1 % ( $P<0.95$ ), II – by 10.9 kg and 43.4%, ( $P>0.999$ ), III – by 14.0 kg and 63.6 % ( $P>0.999$ ) and V – by 5.9 kg and 19.6% ( $P>0.99$ ).

**Table 2: Dynamics of live weight of bulls, kg**

Age, months	Group				
	I	II	III	IV	V
Newborn	34.9 ± 1.98	25.1 ± 0,62	22.0± 0.54	36.0 ± 1.11	30.1± 0.03
3	103.2± 1.75	110.5± 3.11	105.9± 3.11	107.0± 4.92	92.5 ± 4.65
8	170.3± 5.56	191.5± 6.32	168.2± 6.32	200.8 ± 9.34	174.4± 8.63
12	288.5± 6.52	324.1± 5.35	300.9 ± .35	311.0 ± 12.52	314.3 ±12.5
15,5	399.5± 8.75	439.4 ±3.74	434.2 ±3.74	434.3 ± 6.21	415.1±16.9
19.5	527.6± 7.73	566.2 ± 7.59	539.5 7.59	603.9 ± 29,7	556,0±21.5

Differences in live weight are determined with the genetic diversity of breeds. However, by the age of 3 months there were no significant interbreed differences on this basis. The relatively low live weight of young animals at the age of 8 months is associated with stress caused by the wean of bulls from mothers and the movement of animals to other conditions. At the age of 19.5, the advantage in terms of live weight was in favor of the Charolais bulls, which exceeded the peers of group I by 73 kg and 11.4% ( $P > 0.99$ ), respectively II – 37.7 kg and 6.6% ( $P < 0.95$ ) III - by 64.4 kg and 12.2% ( $P > 0.95$ ) and V – 47.3 kg and 10.8% ( $P < 0.95$ ).

It is important to note that the animals of all groups, especially Charolais, in some age periods were characterized by significant quality indicators of live weight, as evidenced by variation coefficients of this trait. The data presented in table 3 give a more detailed picture of the growth rate of animals of different genotypes.

In the period from birth to 3 months the greatest daily increase bulls of II and III groups are differed that surpassed the peers of group I by 185-200 g ( $P > 0.95$ ), IV-by 156-171( $P > 0.95$ ) and V - by 243 and 258 g ( $P > 0.99$ ).

Thus, the analysis of the data of the daily growth of bulls of different breeds shows that the body of animals differently reacted to changes in the environment in different periods of their ontogenesis. With age, the bulls of the Charolais breed showed a high growth rate and by 19.5 months were significantly ahead of their peers of other groups, which is quite natural for one of the large and relatively late-maturing meat breeds. Comparing the results of daily growth of bulls in the period from 8 to 19.5 months the advantage of animals of the Charolais breed is clearly visible, which surpassed peers of group I by 129 g (12.6%), II - 79 g (7.3%), III - 89 g (8.3%) and V - 43 g (3.9%) with the accuracy of the difference:  $P > 0.999$ ,  $P > 0.95$ ,  $P > 0.99$  and  $P > 0.95$ , respectively.

**Table 3: Average daily gain of calves, g**

Age period, months	Group				
	I	II	III	IV	V
0-3	751 ±24,1	936±37,8	951±24,9	780±54,8	693±25,7
0-8	558± 20,4	685±27,5	604±11,7	681±36,5	613±18,4
8-12	972± 45,3	1090±45,1	1087±61,5	903±52,3	1166±28,9
12-15.5	1043± 71,4	1084±21,7	1246±32,1	1157±49,7	951±29,4
15.5-19.5	1054± 0,7	1043±24,3	877±54,7	1396±86,3	1164±12,4
0-15.5	774 ± 17,7	879±8,7	736±13,1	845±35,6	819±18,6
0-19.5	831± 12,4	913±13,6	876±8.6	958±36,7	887±15,6
8-19.5	1021± 13,8	1071±24,9	1061±14,2	1150±8,40	1107±5,6

A more detailed description of the indicators of the meat can be judged from the data of the control slaughter of animals (table 4)

The analysis of the data of table 4 shows that the average carcass weight was obtained from the bulls of all groups at the age of 15.5 months, although they differed in good performance of muscle tissue and satisfactory fat watering. At the same time, some interbreed differences were revealed. Thus, the carcasses of bulls of group II were heavier than those of peers I- by 19.1 kg (10.1%), respectively III - 12.6 kg (10.5%), group IV – 10.6 kg (10.5%) and V - 26.3 kg (9.3%). However, the established differences on this basis were statistically unreliable.

More heavy, with powerfully developed muscles, carcasses were obtained from 19.5-month-old calves. It is characteristic that, in comparison with the previous slaughter, the mass of steamed carcass in bulls of group I increased by 92.5 kg (41.7%), respectively II - by 87.0 kg (36.1%), III - by 73.3% (32.1%), IV - by 132.4 kg (58,%) and V - 97.6 kg and (45.2%). The highest yield of the carcass was observed in Limousin and Charolais bulls, and the lowest - in Salers and Simmental peers. The low level of fat is a natural feature of the French animal breeding.

**Table 4: The results of the control slaughter of bulls**

Parameter	Age, months	Group				
		I	II	III	IV	V
Pre-slaughter live weight, kg	15,5	377.7±6.1	416.0±8.0	407.7±17.7	408.3±12.1	392.3±17.1
	19,5	509.0±12.4	546±6.1	518±18.0	587.0±24.3	537.0±20.2
Steamed carcass weight, kg	15,5	221.6±10.9	240.7±6.4	228.1±12.5	228.1±7.1	214.4±3.5
	19,5	314.1±7.3	327.7±4.2	301.4±11.1	360.5±19.1	312.0±13.1
Carcass output, %	15,5	58.68±12	57.87±0.6	55.44±1.6	55.85±0.5	54.7±1.5
	19,5	61.70±0.11	60.02±0.12	58.18±0.20	61.41±0.06	58.1±0.45
Weight of internal fat, kg	15,5	6.2±0.60	6.8±0.20	6.10±0.30	6.60±0.90	8.0±0.70
	19,5	9,85±0.16	10,09±0.10	10,43±0.10	10,8±0.10	12.2±0.78
Fat output, %	15,5	1.63±0.20	1.63±0.10	1.50±0.10	1.62±0.30	2.0±0.12
	19,5	1.93±0.20	1.99±0.10	2.01±0.10	1.83±0.10	2.3±0.23
Slaughter weight, kg	15,5	227.9±10.7	247.5±6.3	234.2±12.2	234.7±6.7	222.4±4.2
	19,5	323.95±8.3	338.6±4.90	311.83±11.4	371.3±19,0	324.2±13.1
Slaughter output, %	15,5	60.34±1.90	59.50±0.60	57.45±1.60	57.45±10,7	56.7±1.50
	19,5	63.45±0.17	62.01±0.21	60.20±0.20	63.25±0.10	60.4±9.28

The quality of carcasses is largely determined by the ratio of muscle, fat and bone tissue. It is established that in the period from 15.5 to 19.5 months the weight gain of the carcass fabric in half carcasses of calves of group I increased by 92.5 kg (58.2%), II - 34.2 kg (35.5%), III - 27.3 kg (31.0%), IV - 51.2 (57.8%) and V - 97.6 kg (45.5%). The fact of the low level of fat in the 19.5-month-old bulls is noteworthy, in both absolute and relative terms, that is the breed features of the French meat breeds. This means that in the period from 15.5 to 19.5 months in bulls of all groups in relative values, the process of fat formation and carcass growth took place with approximately the same intensity. At the same time, the yield of the flesh part of the carcass per 1 kg of bones in bulls of group I increased by 0.78 kg, II - by 0.54, III - by 0.43, IV - by 1.30 and V - by 0.5 kg, and the meat-bone ratio in carcasses of 19.5-month bulls was 5.75; 5.41; 4.73; 5.62 and 4.60 kg, respectively. This fact we associate with the fact that the animals of Limousin and Charolais breeds in France for a long period selection was carried out to improve the meat qualities, while the Saler breed was used for both milk and meat. Domestic simmentals are a breed of the combined direction of productivity that in many respects explains their worst meat qualities.

An important indicator of the quantitative and qualitative side of the carcass is its morphological composition. By the ratio of muscle, fat and bone tissues to a certain extent, the quality of the carcass is judged. It was found that in the period from 15.5 to 19.5 months the increase in muscle tissue of bulls of group I increased by 37.6 kg (42.4%), II – by 34.2 kg (35.5%), III - by 27.3 kg (31.0), IV - by 51.2 kg (58.7%) and V - by 39.9 kg (35.5%). In turn, the increase in adipose tissue in carcasses during the same period increased by 3.0 kg and 227%, II - by 3.1 kg and 262.2%, III – by 2.91 kg and 234.7%, IV - by 4.56 kg (400%) and V - by 2.3 kg (363.6%). This means that in the body of bulls of all groups in the period from 15.5 to 19.5 months in relative terms the process of fat formation passed more intensively than the build-up of muscle tissue.

The content of bones in absolute values with age of animals of all groups increased, and in relative decreased. Thus, from 15.5 to 19.5 months bone growth in the half-carcasses of bulls of group I increased by 4.45 kg and 24.4%, respectively, II-4.9 kg and 24.5%, III-4.49 kg and 21.5%, IV- 5.13 kg and 24.7% and V- 6.9 kg (33.8%). During the same period, the bone content in relative values decreased by 2.1, 1.58, 1.58, 3.67 and 1.9%, respectively.

It should be noted that the highest content of bones in relative terms was observed in bulls of Simmental breed in comparison with peers of other groups. At the same time, the yield of flesh per 1 kg of carcass bones at the age of 19.5 months was in animals of group I-5.75, respectively II-5.41, III-4.73, IV-5.62 and V-4.6 kg. The low bone meat coefficient in Simmental bulls is determined by their breed affiliation.

Along with this, characteristics of individual parts of the carcass and the ratio of tissues in them in connection with the breed and age of animals are of great scientific and practical interest. It found that with the age of the animals weight of the parts of their carcasses in absolute and relative terms increased, while the

rate of lumbar and hip parts had a tendency to relative decrease. To 19.5 months the advantage on the mass of the most valuable parts of the carcass was in favor of the bulls of Charolais and Limousin breeds. At the same time, the advantage of most of them was in favor of the bulls of the Charolais breed, as one of the most highly productive in the world.

The highest muscle-bone ratio (5.4 kg) was observed in half carcasses of Charolais bulls, and relatively low (4.47 kg) - in Simmental peers.

An objective assessment of the quality of slaughter products can be obtained from chemical analysis. Beef is valued primarily as a product of protein nutrition, judging by the content of protein and fat in the meat of bulls of different groups, the meat of 19.5-month bulls was of better quality, with a ratio of protein and fat in the energy dimension, as 1:1. However, the ratio between protein and fat in the meat of 15.5 monthly bulls in the energy dimension was within 1.25:-1.4:1, although this figure in 19.5 months animals was 0.8-0.9:1, which is close to the desired results.

An important indicator of the quality of meat is the pH of water-meat extract, the value of which was in the range of 5.3-5.7, indicating the suitability of meat for long-term storage. Protein quality index was more than 5, which indicates the high biological value of 19.5-month bulls' meat of all groups.

Heavy metal salts, nitrates and nitrites are a great danger for animals and humans. The study of the level of contamination of the edible part of the carcass showed that the content of heavy metals and other harmful substances was within the permissible level of concentration. All this is due to the fact that in the area of livestock there are practically no sources of contamination of feed, which allows producing high-quality, environmentally friendly beef that meets sanitary and hygienic standards.

From intensively grown bulls, as a rule, heavy leather raw materials are received, designed for technical purposes too. We found that from calves of all the groups already at 15.5 months raw materials were received weighing more than 30 kg. More heavy were the skins of 19.5-month-old Charolais bulls -55.5 kg and relatively lightweight - raw material from Limousin peer – 42.0 kg.

The specificity of specialized beef cattle breeding is that the only main product is received - meat, and all costs incurred during the year, including the maintenance of the mother, are transferred to the resulting offspring. At the same time, the profitability of meat production in the cultivation of bulls up to 19.5 months was 10.0-12.0%, although the implementation of animals per tribe, this figure increased significantly. Therefore, the only way to increase beef production from beef cattle breeding is to increase the intensity of growth of bulls grown for meat at minimum cost of feed, labor and funds.

## DISCUSSION

At the present stage of agricultural development one of the important and complex problems facing the livestock industry is the increase in meat production and, first of all, beef that is on its biological qualities most appropriate for the normal functioning of the human body [2,4,22]. Currently, most regions of Russia, along with domestic breeds, pay great attention to the formation of meat herds on the basis of Aberdeen-Angus breed and types of beef cattle created on the basis of domestic and foreign selection of animals.

At the same time, Russia has contrasting natural and climatic conditions in which a limited number of breeds can dominate. In this regard, in the Central Black Earth region animals of five breeds of French origins were imported from France, of which the Gascon was characterized by extremely poor acclimatization abilities and breeding of animals of this genotype was discontinued. The objective of the research was to examine the comparative productive and meat quality of calves of the French meat breeds and Simmental peers at their intensive farming to 19.5 months.

When growing bulls for meat up to 19.5 months weight of their carcasses was more than 300 kg. While the animals of Limousin, Abraxas, and Charolais breeds were superior Simmental peers by yield of carcass – by 1.92 - 3.6 %, the pulp of 1 kg per 1 kg of bones by 0.13-1.15 kg, muscle by 1.57% to 2.8%. Animals of Salers breed on these indicators with unreliable difference inferior Simmental bulls, although some of them were superior to the latter. This is due to the fact that Salers in France for a long period were bred for both

milk and meat, and the selection of cattle of this breed for improving meat quality has not reached the desired results yet. Obviously, this will require a certain period of breeding. Regarding Simmental, it is important to note that this breed is a combined direction of productivity. Therefore, they could hardly compete with meat breeds in most indicators of growth, meat productivity and economic efficiency [15,18,20].

In the comparative assessment of the growth and development of bulls, we took into account that the phenotype of the animal is formed under the influence of the genotype and the environment [7,13,19]. It is no coincidence that the minimum live weight was characterized by Salers newborn calves, although milk production of cows of Salers breed is clearly higher than that of peers of other breeds. This fact we associate with the possible tension of physiological functions associated with the acclimatization of animals.

A comparison of linear growth and build indexes gives the possibility to state that bulls of all breeds were distinguished by well-developed meat forms with well-developed rear third of the body already in 18 months. The best meat forms in all age periods have the Charolais bulls, which largely contributed to their higher indices of meat productivity.

The quality of beef is largely determined not only by the amount and yield of muscle tissue, but also by its chemical composition [14,16,21]. Comparing the results of studies characterizing the quality of meat, significant interbreed differences in these indicators were not revealed. At the same time, according to the biological value of muscle tissue of 19.5-month bulls, estimated by protein quality index (5.4-5.83), moisture capacity (51.0-51.9), pH (5.3-5.7), color, tenderness and marbling, muscle tissue had high technological and culinary properties. All this testifies to the expediency of growing bulls of all groups up to 19.5 months.

Judging by the size of the live weight of bulls, carcass yield and slaughter yield, the ratio of tissues in the carcass, the chemical composition of meat, the economic efficiency of beef production, it is less advisable to grow for the meat the bulls of Simmental breed of domestic selection. For production of high-quality beef in the Central Black Earth zone of Russia it is recommended to form the branch of meat cattle breeding mainly at the expense of cattle of meat breeds of the French selection.

## CONCLUSIONS

In order to increase the production of high-quality, environmentally friendly beef it is advisable in the Central Black Earth zone of Russia to form the branch of beef cattle breeding through the cattle breeding of meat breeds of French selection-Charolais, Abraxas, Limousin and Saler breeds.

- Analysis and comparison of the absolute values of linear measurements showed that animals of all groups grew well. By 18 months they were different in proportional physique. They had a well-developed chest, back, lower back, leg quarters, i.e. meat type. The most high musculature index was observed in the carcasses of bulls of Limousin, Charolais and Abraxas breeds.
- In 19.5 months the live weight of bulls of Charolais breed was 603,9 kg, Abraxas - 566,2, Salers - 539,5, Limousin - 527,6 and Simmental - 518,9 kg and average daily gain for 19.5-month cultivation period – 958, 913, 876, 831 and 887 g, respectively.
- At the age of 19.5 months from calves of all groups heavy carcasses were received, the mass of which from Limousin bulls was 314,1 kg, Abraxas - 327,7, Salers-301,4, Charolais - 360,5 and Simmental - 312,0 kg, per 1 kg of bones in the carcasses of 19.5-month-old bulls of the Limousin breed had of 5.75 kg of the edible portion of the carcass, respectively Abraxas - of 5.41, Salers - 4,73, Charolais - of 5.62 and Simmental - 4.6 kg.
- The chemical composition of the meat obtained from 19.5-month bulls met the requirements of the modern consumer. In this case, the protein content was 17.62-19.29% and fat 10.21-12.62%, which corresponds to the ratio in energy units close to 1:1.
- It was found that in the meat of bulls of all breeds grown on own production feed, the presence of toxic elements (Cu., Zn. Mn. Cu., Kd. and Pb) and other harmful substances is significantly lower than the permissible concentration, which indicates the possibility of production of environmentally friendly beef.
- Comparing the results of studies characterizing the quality of meat, significant interbreed differences in these indicators were not established. However, according to the biological value of muscle tissue of 19.5-month bulls, estimated by protein quality index (5.40-5.83), moisture capacity (51.0-51.9), pH (5.3-

5.7), as well as indicators of color, tenderness and marbling, muscle tissue of bulls had high technological and culinary properties. The energy value of 1 kg of the edible part of the carcass of 19.5-month bulls of all groups was 8382,8-9531,4 kJ, which fully meets the requirements of the modern consumer.

- From bulls high-quality leather raw materials was received without the presence of lifetime defects that meet the requirements of grade I, although the more valuable skins were from 19.5-month-old young animals.
- Economic evaluation of the results of growing bulls of French selection suggests that with the current production costs and the implementation price of meat, the profitability of the industry can provide an average daily increase in calves from birth to 19.5 months within 850 - 950 g, at the cost of feed per 1 kg of growth, taking into account those for the maintenance of the cow, 12.3-13.2 kg of feed units.

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