The results of growing meat bulls

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Abstract. The article presents the results of a scientific and economic experiment to assess the meat productivity of Kazakh white-headed bulls in the conditions of Southern Russia. he fattening of the bulls lasted until the age of 15 months. During the fattening period, the animals of the experimental group surpassed the peers of the control group according to indicators of meat productivity. By changing the conditions of feeding and keeping calves at different age stages of their development, a person forms in them those vital functions, organs and tissues that most contribute to ultimately obtaining the greatest amount of high quality milk and meat productivity in adulthood. The paper presents the results of growing bulls of the Kazakh white-headed breed up to 15 months of age using the probiotic Prolaxim-V feed additive to obtain meat raw materials that meet the requirements for the production of food for children of early age. The use of a probiotic feed additive made it possible to increase the live weight by the end of the experiment by 8.65% ($P < 0.01$), the slaughter yield by 1.95 absolute percent, and reduce the incidence rate of the gastrointestinal tract. Key words: ecologically friendly raw material zone, meat and dairy bulls, chemical composition of the longissimus dorsi muscle, safety of beef

1 Introduction

Cattle breeding in Russia is carried out by both large agro-industrial enterprises and small farms. Unfortunately, recently there has been a steady downward trend in meat breeds of cattle due to the high competition of imported raw materials, long-term payback, as well as the lack of state support for the industry.

The leading regions for the production of beef in Russia are: the Republic of Bashkortostan, the Republic of Tatarstan, the Republic of Dagestan. The share of the region in Russia was 6.2, 6.1 and 4.3%, respectively. The volume of beef production in the Krasnodar Territory amounted to 4.2%. In the Krasnodar Territory in 2021, in all categories of farms, there were about 552.1 thousand heads of cattle, including 214.7 thousand heads of cows. Production of cattle for slaughter amounted to about 18 thousand tons, or 12.7% higher compared to the previous year. It is practically impossible to solve the problem of the deficit of high-quality dietary beef without beef cattle breeding [1-4].

According to Rosstat (Federal State Statistics Service), since 2015 there has been a steady upward trend in the production of canned meat for children. The reason for this is

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the high birth rate, changes in the lifestyle of families, as well as the economic situation in the country. More and more parents prefer to purchase ready-made complementary foods, which include not only meat, but also various vegetables, cereals and other components. The presence of various components contributes to a significant increase in their nutritional value, improve taste. In addition, in ready-made canned foods, the products are crushed to such an extent that it is not possible to achieve at home. It has been proven that adult food is much worse digested by the child's body than specialized food.

This is due to the immaturity of the systems involved in the process of digestion and absorption of nutrients [5,6].

Standard fattening of bulls of meat productivity in accordance with the requirements for obtaining lean meat for the production of dietary products for children and functional nutrition (sports, therapeutic with a functional effect on the body as a whole, and on vital organs), involves the choice of adapted productive meat breeds with an optimal biological status [7-11].

Meat raw materials used for the production of baby food must meet the increased requirements for organic products. It must be obtained from healthy young animals produced in accordance with the veterinary and zootechnical rules for growing and fattening without the use of growth stimulants, hormonal drugs, feed antibiotics, synthetic nitrogen-containing substances, microbial synthesis products and other types of non-traditional feed products and must meet the requirements for meat raw materials for baby food, Technical Regulation of the Customs Union "On food safety" TR CU 021/2011.

Such requirements will be met to a greater extent by animals grown on natural pastures. It is the protein of beef, and especially veal, which is well absorbed, ensuring the healthy growth of the child's body. The taste and nutritional value of beef is great. Beef muscle tissue, which makes up 50-64% of the carcass mass, consists of: water 72-75%, protein 18-22%, fat 2-3%, non-protein nitrogenous extractives 1.5-2.5%. Also, the composition of beef meat is characterized by a wide range of B vitamins, macro and microelements.

2 Materials and Methods

The content of connective and adipose tissue in raw meat used in the production of baby food should be no more than 20 percent. The safety of food raw materials must be ensured throughout the entire production cycle, from the selection of the farm to the production of the product. The purpose of our research was to study meat productivity and the quality of meat raw materials on calves of the Kazakh white-headed breed in the conditions of the Agricultural Production Cooperative (collective farm) named after Apanasenko, Apanasenkovsky district, Stavropol Territory, up to 16 months of age. Animals were selected by the method of pair-analogues and put to experiment according to the approved design of the experiment. The first control group received the main diet, and the second experimental group was fed the Prolaxim-V probiotic feed additive in addition to the main diet.

Livestock enterprises for the environmentally safe fattening of young cattle of meat breeds are located in the raw material zone of the “Tikhoretsky Canning Factory for Children” in the Krasnodar and Stavropol Territories, the Rostov and Volgograd regions, Kalmykia, Adyghe and Karachay-Cherkessia. In these farms, young meat breeds are being fattened for beef baby food. These farms with all environment objects are the subject of quarterly ecological monitoring.

The results of the study conducted by the authors indicate the influence of the genotype, the technology of keeping and fattening, the quality and safety of feed, the physiological state of animals on their productivity and the physico-chemical composition of beef and its organoleptic characteristics [3-12]. It is important to obtain environmentally friendly high-

quality beef in accordance with increased requirements for the nutritional value and safety of raw materials for dietary products and, first of all, baby food [13].

Currently, in animal husbandry, the use of probiotic preparations is of practical interest, which are a complex of beneficial microorganisms that, getting into the gastrointestinal tract of animals, with the help of the enzymes they produce, participate in the breakdown of amino acids, fats, carbohydrates, vitamins, trace elements, which helps to increase the assimilation of feed. In the end, this is expressed in an increase in animal productivity: milk yield in cows, live weight gain in young animals, and an increase in its safety.

According to a number of foreign and domestic authors [12,13] the use of probiotic preparations in cattle feeding improves metabolism and, consequently, increases meat productivity, as well as the morphological composition of slaughter animal carcasses. The purpose of our research was to determine the effect of the Prolaxim-V probiotic preparation on the growth and development of young cattle, as well as on the indicators of control slaughter.

In the Department of toxicology and feed quality, Prolaxim-V is a probiotic preparation drug based on a complex of lacto and propionic bacteria Streptococcus salivarius LT -1, Lactobacillus acidophilus LT -12, Propionibacterium freudenreichi LT – 8, Streptococcus thermophilus LT -9, LT- 10. It is a homogeneous structure from white to cream color, easily soluble in water.

Probiotic preparation Prolaxim-V it has a wide spectrum of antagonistic activity against pathogenic and opportunistic bacteria, displacing them from the intestinal microflora. It is intended for the cultivation of farm animals in order to normalize the work of the gastrointestinal tract, by combating pathogenic bacteria, mycotoxins and to improve production performance.

In this regard, we consider it relevant to search, develop and apply new feed additives that meet the requirements and ensure the realization of the potential of highly productive animals.

Control over the growth of experimental animals was carried out by monthly control weighing. At the age of 15 months, a control slaughter of 3 heads per group was carried out. Based on the results of the control slaughter, such indicators were determined as: pre-slaughter live weight, weight and yield of a fresh carcass, slaughter weight and slaughter yield were calculated.

The number of leukocytes and erythrocytes in the blood was calculated in the Goryaev chamber, hemoglobin was determined by the hemiglobin cyanide method, hematocrit - in a hematocrit centrifuge. The concentration of glucose in the blood was determined by the glucose oxidase method. The intervals of values given in the literature were taken as the physiological norm of indicators (Kondrakhin, 2004; Karput, 1986; Bovkun, 2005).

Zootechnical analysis of feed, the chemical composition of raw meat was carried out in the department of toxicology and feed quality «Krasnodar Research Centre for Animal Husbandry and Veterinary Medicine ».

3 Results and discussion

Experimental animals were kept according to the technology adopted in the farm: in summer - on pastures, in winter - indoors. The stable period fell on the first 90 days of the suckling period. The rations were formulated taking into account the maximum gain in live weight. The structure of the diet for young cattle in the first three months of the suckling period included mother's milk - 6 l, salt - 10 g, chalk - 15 g, and from 2 weeks of age, animals began to be accustomed to eating concentrated feed - 300 g. The structure of the diet of cows during the stable period was as follows: hay from miscellaneous herbs - 9 kg, barley straw - 11 kg, concentrated feed - 2 kg, common salt - 35 g, mineral supplement - 50

g. From three to five months of age, bulls and heifers were kept on pasture. The feeding ration during this period consisted of: milk - 7 l, pasture grass - 5-6 kg, concentrated feed (bran) - 300 g, table salt - 35 g, mineral supplement - 50 g. By the time of weaning (5 months old), the young animals already received as part of the diet - 20 kg of pasture grass, 2 kg of straw, 1 kg of concentrated feed.

During the entire period of bull calves rearing, daily monitoring of the general condition and behavior of animals, feed and water consumption was carried out. In addition, the clinical status of the animals was assessed, possible pathologies were recorded.

Additional introduction of the probiotic feed additive "Prolaxim-V" to young cattle contributed to a more complete realization of the potential of animals. At the beginning of the experiment, the bulls of the experimental groups had almost the same live weight. In the course of the experiment, it was found that the animals of the II experimental group had more growth energy. Thus, if in the first month of growing the young animals of the experimental group exceeded their peers in the control group by 5.6%, then by the age of 5 months, this difference was 9.7% or 12.49 kg higher. In the final period of growing, the advantage of the animals of the experimental group in terms of growth rate was obvious (Table 1).

Table 1. Dynamics of live weight of experimental young animals.

Index	**Group (n=15; *P≤0.05)**	
	I-control	**II-experimental**
Live weight in the suckling period:		
At birth, kg %	23.31±0.64 100.0	23.18±0.73 99.44
At 30 days, kg %	39.87±1.13 100.0	42.1±2.64 105.6
At 60 days, kg %	57.81±2.04 100	63.24±2.70 109.4
At 150 days, kg %	128.71±3.11 100.0	141.2±2.98* 109.7
Average daily gain for 150 days	703 100	787 112
Live weight during finishing growing period		
At the end of the experiment, at15 months	368.4±4.32 100.0	400.3±5.13* 108.7
gastrointestinal morbidity, %	13	not found

By the age of 15 months, the difference in favor of the bulls of the experimental group was 31.9 kg or by 8.65% more ($P < 0.01$). In the experimental group, where, in addition to the basal diet, the probiotic feed additive of Prolaxim-V was fed, the average daily gain in live weight was 631; 705; 866 and 864 g or to 17.89% higher than in the control peer group. Thus, the animals of the experimental group had the highest growth rate when the feed additive was included.

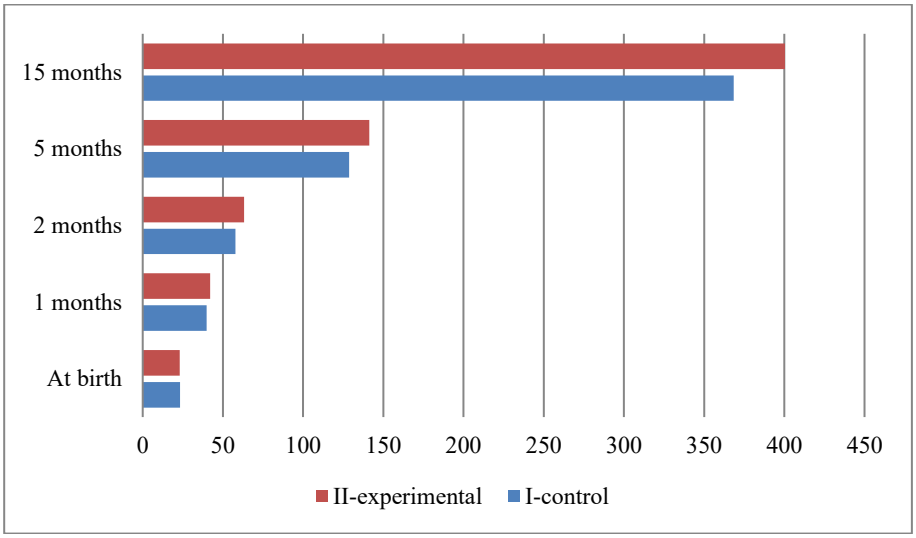

Fig. 1. Dynamics of live weight of bulls, kg.

It is necessary to note an important factor as gastrointestinal diseases. So, in the experimental group, no signs of dysbacteriosis were revealed, while in the control group this figure was 13.0%.

An analysis of the morphological and biochemical values of the bulls' blood showed that in animals of all experimental groups, these parameters were within the physiological norms (Table 2). At the beginning of the experiment, there were no significant differences in the studied parameters between the groups.

Table 2. Morphological and biochemical parameters of the blood of bulls.

Index		Group (n=6; *P≤0.05)	
		I-control	II-experimental
Leukocytes 10^9/ l		7.11±0.13	7.22±0.10
Erythrocytes, 10^{12}/l		5.44±0.17	5.57±0.23
Hemoglobin, g/l		107.1±1.59	114.6±1.81*
Total protein, g/l		72.4±0.94	77.5±0.80*
Albumins, g/l		26.2±0.86	31.8±1.4*
Globulins/ g/l	α	10.43±1.22	10,14±1,97
	β	11.4±2.50	11,32±2,13
	γ	24.48±1.2	23,39±1,11
ALAT, IU / l		52.8±2.52	57.6±2.24
ASAT, IU / l		71.7±2.91	76.3±3.30
Glucose, mmol/l		3.20±0.07	3.63±0.12*
Cholesterol, mmol/l		4.50±0.7	3.55±0.6
Urea, mmol/l		4.16±0.06	3.38±0.15

Note: [1] - pH of arterial blood was determined before slaughter; * - p <0.05; ** - in winter, the physiological limits of carotene are 7.5 -18.6; in pasture - 16.8-52.2 μmol/l; *** - calculated using the indirect optical Warburg test.

From the data in Table 2, a higher glucose content in the blood serum of bulls of the experimental group was revealed in comparison with analogues of the control group by 13.43% (P≤0.001), which is associated with a higher stimulation of bioenergetic processes

and a positive effect on the carbohydrate metabolism of the complex of microorganisms of the probiotic drug «Prolaxim-V».

However, at the end of the experiment, the calves of the experimental group showed a slight increase in hemoglobin, erythrocytes, total protein by 4.1; 2.4 and 3.8%, respectively, compared with peers in the control group. The activity of AST and ALT by the end of the experiment increased by 6.1 and 8.4% in comparison with the animals of the control group.

In animal husbandry, the slaughter yield of meat is an important economic indicator, as it includes muscle and bone tissue, cartilage and tendons, that is, the yield of products that goes to the consumer.

At the end of the experiment, at the age of 15 months, a control slaughter of bulls was carried out (3 heads per group). Table 3 shows the main indicators of meat productivity.

Table 3. Slaughter qualities and morphological composition of carcasses of bulls (*P ≤ 0.05).

Index		Group	
		I-control	**II-experimental**
Pre-slaughter live weight, kg		361.3	394.6
%		100.0	109.2
Slaughter weight, kg		203.3±2.83	229.8±2.54*
%		100.0	113.0
Slaughter yield, %		56.28	58.23
Fresh carcass weight, kg		193.6±2.51	216.5±2.33*
%		100.0	111.8
Carcass output,%		53.58	54.86
Weight of raw visceral fat, kg		10.97±0.24	11.31±0.26
%		100.0	103.1
Weight of chilled carcass, kg		191.3±2.47	213.4±2.23*
%		100.0	111.6
Weight of flesh. kg		146.1±2.2	167.6±1.75*
%		100.0	114.7
Flesh output, %		76.37	78.54
Weight of bones, kg		36.25±0.22	38.41±0.22
%		100.0	105.95
Weight of tendons and ligaments, kg		8.38±0.12	7.28±0.08
Ratio of	edible part	3.27	3.67
	inedible part		

The conditions of feeding and housing had an impact on the fatness of the experimental animals. During slaughter, the carcasses of experimental animals were assigned to the first category. From the data of table 2, we can conclude that the slaughter yield in the experimental group during the growing period exceeded the analogues of the control by 1.95 absolute percent. The weight of the fresh carcass in the experimental group was 216.5 kg, which is 10.62% higher than the control. The weight of the chilled carcass in the control was lower by 10.36%. More clearly, the indicators of meat productivity of bulls can be seen in Figure 2.

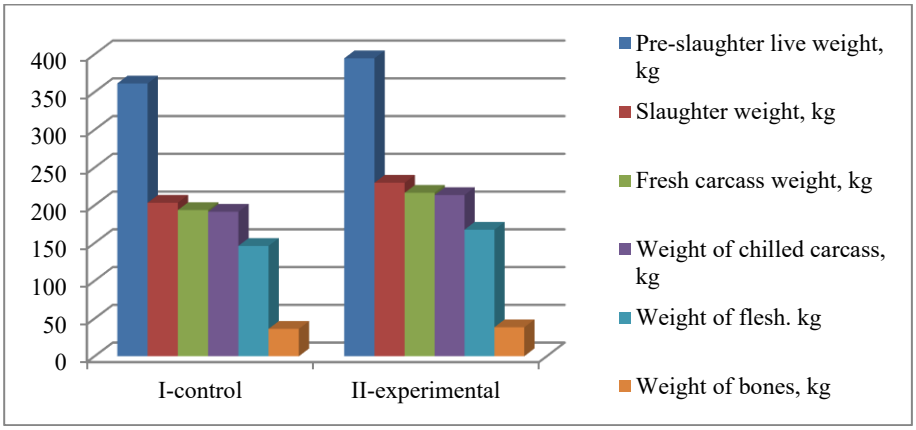

Fig. 2. Slaughter qualities and morphological composition of carcasses of bulls, kg.

According to the main indicator of the weight of the flesh, which characterizes the value of the carcass, the bulls of the experimental groups exceeded their peers in the control group, respectively, by 14.71%. The ratio of edible parts to inedible parts in the experimental groups was higher in the experimental group compared to the control because the weight of bones and tendons in the bulls of the studied groups differed slightly.

To determine the chemical composition of meat, the sample was taken from the longissimus muscle of the back (Table 4).

Table 4. Chemical composition of the longissimus muscle.

Item	Permissible levels	Group	
		I-control	II-experimental
Physical and chemical indicators:			
Caloric content, kcal/100 g	no more 156.6	153.3	156.0
Moisture content, %	-	76.53	75.66
Protein content, %,	no more 18,9	19.2±0.88	20.1±0.61
Fat content, %,	no more 9.0	8.4±0.7	8.74±0.54
Total phosphorus content, %	no more 0.2	0.05	0.05
Toxic elements:			
Lead, mg/kg	no more 0.1	0.06±0.03	0.03±0.02
Arsenic, mg/kg	no more 0.1	less 0.0025*	less 0.0025*
Cadmium, mg/kg	no more 0.03	less 0.01*	less 0.01*
Mercury, mg/kg	no more 0.01	less 0.005*	less 0.005*
Pesticides:			
Hexachlorocyclohexane (α,β,γ-isomers), mg/kg	no more 0.1	less 0,05*	less 0,05*
DDT and its metabolites, mg/kg	no more 0.1	less 0,05*	less 0,05*
Antibiotics:			
Levomycetin (mg/kg)	no more 0.0003	less 0,0003*	less 0,0003*
Tetracycline group (units/g)	no more 0.01	not detected	not detected
Bacitracin (units/g)	no more 0.02	not detected	not detected

* lower detection limit.

The use of the Prolaxim-V probiotic supplement as part of the diet for bulls made it possible to improve the body's metabolism, accelerate growth energy, and increase meat productivity. There were practically no differences in the physicochemical composition and safety indicators of the muscle tissue of the animals of the experimental groups. All groups of animals met the requirements of GOST (State Standard) 31799-2012 for beef meat for the production of food for young children.

In recent decades, the study of intestinal microorganisms, their effect on digestion, as well as the metabolism of ruminants, has aroused increased interest, both scientists and animal husbandry practitioners. The results of these studies contribute to the organization of more rational and full-fledged animal feeding and the effective use of feed to increase productivity.

A decrease in the amount of lactic acid microflora and changes in the ratio of various groups of microorganisms in the digestive tract, which are not yet diagnosed as a disease, leads to a violation of the absorption of nutrients and, as a result, causes significant economic damage to livestock enterprises.

In our studies, the study of intestinal microbiocenosis was carried out during the slaughter of young cattle at 15 months of age, the results of which are shown in Table 5.

Table 5. Composition of intestinal microflora of Kazakh white-headed bulls at 15 months of age.

Item	Group	
	I-control	I-control
Bifidobacteria. KOE/г	$10*10^5$	$11*10^6$
Lactobacilli. KOE/г	$10*10^6$	$2.4*10^8$
Enterobacteria. KOE/г	$1.1*10^6$	$2.6*10^3$
Staphylococcus spp.. KOE/г	$1.6*10^5$	$6.0*10^4$
Lactic microorganisms. KOE/г	$5.6*10^7$	$1.5*10^8$
Yeast. KOE/г	more 10^6	$1.4*10^3$
Mold. KOE/г	$5.0*10^2$	$4.3*10^1$

The work performed by intestinal microorganisms is difficult and invisible, at least at first glance. Microbiota is necessary for the effective functioning of the immune system. Its composition is influenced by diseases, medications, especially antibiotics. However, it is the microbiota that is needed to perform several important functions of the body [14, 15]. The data in Table 5 indicate that when the probiotic preparation "Prolaxim-B" was introduced into the feeding diet of Kazakh white-headed bulls, it allowed several times to reduce the number of conditionally pathogenic microorganisms with a simultaneous increase in the beneficial microflora.

4 Conclusions

1. The introduction of the probiotic drug "Prolaxim-B" into the diet of bulls contributed to an increase in live weight at the end of the experiment by 31.9 kg or higher by 8.65% ($P < 0.01$), an average daily increase to 17.89%;
2. When studying the morphological and biochemical composition of the blood of experimental young animals at the end of the experiment, an increase in glucose levels in the blood serum of bulls of the experimental group was found in comparison with control analogues by 13.43% ($P\leq 0.001$), hemoglobin, erythrocytes, total protein by 7.0; 2.4 and 3.8 %;
3. As a result of the control slaughter of bulls at the end of the experiment, the mass of the paired carcass in the experimental group was higher than 10.62% of the control.

4. The introduction of the probiotic drug "Prolaxim-B" into the feeding diet of Kazakh white-headed bulls, contributed to a decrease in the number of conditionally pathogenic microorganisms with a simultaneous increase in beneficial microflora, which is accompanied by activation of metabolic processes in the body of animals, and this contributes to their higher productivity in comparison with the control.

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