

Research Journal of Pharmaceutical, Biological and Chemical Sciences

The Impact Of Innovative Fodder Additive On The Meat Productivity And Quality Parameters Of Beef.

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ABSTRACT

The article presents a research, containing the study of the «KoreMix» fodder additive impact on growth rate, slaughter qualities, chemical and biochemical composition of bull-calves meat. It was established as a result of the conducted researches that the bull-calves of the experimental group exceeded the peers of the control group by 5.99 kg, or 18.26% in the age period of 13-14 months of age; by 2.50 kg, or 8.81% in 14-15 months of age; by 2.88 kg, or 4.02% in 15-16 months of age. The carrying out of the bull-calves control slaughter showed that the bull-calves of the experimental group exceeded the peers of the control group by 12.60 kg, or 5.62% in weight of freshly chilled carcass; by 1.45% in carcass output; by 2.36 kg, or 20.56% in mass of internal raw fat; by 0.52% in raw fat output; by 14.96 kg, or 6.35% in slaughter weight, and by 1.95% in slaughter output respectively. It was established during the research process that there were more contained fatty acids in the beef obtained from the bull-calves of the experimental group, such as the following: caprylic (C8:0), which is more in comparison with the control group by 0.67%; palmitic (C16:0) – by 0.43%; myristic (C14:0) – by 1.11%; cis-10-pentadecenoic (C15:1) – by 1.15%; oleic (C18:1) – by 4.96%; linoleic (C18:2) – by 0.24%; eicosapentaenoic (C20:5) – by 0.44%; gondoic (C20:1) – by 1.39%; erucic (C22:1) – by 0.81% respectively. The introduction of a new fodder additive helps to increase the meat productivity of Kalmykian breed bull-calves and significantly improves the slaughter and quality parameters of beef.

Keywords: fodder additive, bull-calves, Kalmykian breed, live weight, meat productivity, average daily growth, slaughter weight, slaughter output.

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INTRODUCTION

The high-quality raw meat, namely «marbled» beef, produced from cattle of meat productivity specialization is the most popular for consumers [1-4].

Kalmykian breed occupies one of the leading places among breeds of meat productivity specialization cattle bred within the territory of Russian Federation, due to its biological characteristics: high viability, relative unpretentiousness to conditions of the maintenance and feeding [1, 2, 5, 15].

Feeding is one of the most important factors affecting the increase in meat manufacturing.

Provision of rations with necessary nutrients takes a special role in animal feeding due to introduction of new fodder additives and means.

The study of biogenic or bio-stimulating preparations influence in cattle rations on the increase in meat productivity is of particular interest.

It should be particularly noted that additives with bio-available elements, which are necessary for the enrichment of animal rations, are ecologically safe for their health, as well as for the health of the end consumer.

The study of the influence of innovative fodder additives in feeding of Kalmykian breed bull-calves to increase beef production and improve its quality is a perspective task that requires an immediate solution.

The aim of research is a study of «KoreMix» innovative fodder additive influence on the beef manufacture increasing and improving its quality parameters during the inclusion to the Kalmykian breed bull-calves rations.

The following tasks were solved during the research:

- to study of «KoreMix» innovative fodder additive influence on the Kalmykian breed bull-calves meat productivity;
- to carry out the control slaughter of the experimental bull-calves and to establish «KoreMix» fodder additive effect on the formation of slaughter parameters.
- to define «KoreMix» fodder additive effect on the formation of quality parameters of the beef.

MATERIALS AND METHODS

There were formed 2 groups of Kalmykian breed bull-calves of 10 months age of 30 heads in each group for carrying out the research work in manufacture conditions of «Kirovskiy» Noncommercial Stock Company Breeding plant of Kalmykia Republic.

Animals of the control group received a general ration (GR), and animals of the experimental group received a general ration with a «KoreMix» fodder additive of 2.5 kg per ton of concentrated fodder. The experimental bull-calves of studied groups participated in the experiment from 10 months of age for 180 days. Experimental animals were housed in individual exercise yards.

Animals were fed in groups similarly, the fodder was distributed to group feeders (troughs), fixed on the perimeter.

The ration for the experimental animals was designed to obtain average daily growth at the level of 900-950 g. The ration included cereal-mixed grass hay – 7.5-9.0 kg, barley straw – 2.5-4.0 kg, concentrated fodder – 2.8-4.6 kg, feed phosphate – 9.1-20.8 g, mineral premix – 32.5-48.5 g, sodium chloride – 37.7-48.9 g. The ration for the experimental animals had a nutritional value of 6.3-9.5 energy feed units (EFU), 62.5-94.0 megajoules (MJ) of energy.

The «KoreMix» innovative fodder additive (technical conditions TC 9296-220-10514645-16) consists of biogenic silicium concentrate enriched with Saccharomyces cerevisiae yeast cultures and Bacillus subtilis lactic bacterium cultures.

The intensity of animals growth, average daily growth and absolute growth of live weight were studied by results of monthly weighting of experimental young animals.

The relative growth rate was defined by the method of Brodie S. (1926).

The meat productivity and slaughter qualities of 16 months age animals was defined on the basis of the control slaughter of 3 bull-calves from each studied group by the method of All-Union Academy of agricultural Sciences named after V.I. Lenin and All-Russian Institute of Animal Husbandry (1977).

There were determined the following characteristics as a result of the control slaughter: pre-slaughter live weight, weight of freshly chilled carcass, carcass output, slaughter weight, slaughter output by the method of All-Union Academy of agricultural Sciences named after V.I. Lenin and All-Russian Institute of Animal Husbandry (1977).

Determination of the morphological composition of the carcasses of the experimental bull-calves was carried out according to the results of the meat trimming and boning of chilled right half-carcasses taking into account muscle and bone tissue, meat index and relative meat output per 100 kg of live weight were calculated according to State Standard 52601-2006.

The chemical composition of the meat was determined by the following methods: the moisture level in the test samples – according to Russian State Standard 51479-99 by drying the sample to a constant weight at a temperature of $103 \pm 2^\circ\text{C}$; the fat level – by the extraction of the dry sample with ether in Soxhlet apparatus; the protein level – by a method for total nitrogen definition of Kjeldahl combined with isometric distillation in Conway cups.

Biochemical studies of the meat were carried out in an automatic analyzer «OlympusAU-400».

The experimental studies, represented in the article, are processed by methods of variation statistics with determination of criterion of difference reliability by Student-Fischer test with three levels of probability with the program «STATISTIKA-6» [13].

RESULTS

It is established as a result of the research that the bull-calves of the experimental group exceeded the peers of the control group in the age period of 13-14 months age by 5.99 kg, or 18.26% ($P > 0,999$); 14-15 months age – by 2.50 kg, or 8.81% ($P > 0,999$); 15-16 months age – by 2.88 кг, или 4.02% ($P > 0,999$) (table 1)

Table 1: Dynamics of live weight of Kalmykian breed bull-calves (n=10)

Age period, months	Experimental groups	
	control	experimental
12–13	24,73±0,43	25,53±0,37
13–14	26,81±0,62	32,80±0,55***
14–15	25,89±0,39	28,39±0,38***
15–16	23,90±0,47	26,78±0,54***
12–16	101,33±2,21	113,50±2,16***

The bull-calves live weight absolute growth of the experimental group is greater in comparison with analogues of the control group by 12.17 кг, or 10.72% ($P > 0,99$) for the entire period of the fattening (10-16 months).

The calculation showed that the animals of the studied groups did not grow evenly over the periods of growth: the bull-calves of the control group from 796.8 g (15-16 months) to 893.6 g (13-14 months), the experimental group – from 851.1 g (12-13 months) to 1093.4 g (13-14 months).

In general, for the entire experiment, the average daily live weight growth was 945.8 kg, which is more in comparison with analogues of the control group by 101.6 g, или 12.03% (P>0,999).

In our opinion, the increasing of absolute and average daily live weight of the experimental group bull-calves in comparison with analogues of the control group was due to a positive effect of biogenic silicium in the bodies of the animals.

There was carried out the control slaughter of three bull-calves from each group in the age period of 16 months at slaughterhouse of the meat processing plant of Kalmykian Republic to study the slaughter characteristics of the bulls.

As you can see from the data, presented in table 2, the weight of freshly chilled carcass of experimental group bull-calves was 224.17 kg, which is greater in comparison with analogues of the control group by 12.60 kg, or 5.62% (P>0,95); according to carcass output – by 1.45%; according to the weight of raw fat – by 2.36 kg, or 20.56% (P>0,999); according to raw fat output – by 0.52%; according to slaughter weight – by 14.96 kg, or 6.35% (P>0,99), and according to the slaughter output – by 1.97% respectively.

Table 2: Slaughter characteristics of experimental bull-calves (n=3)

Parameter	Experimental groups	
	control	experimental
Pre-slaughter weight, kg	388,85±2,49	401,31±3,15*
Weight of freshly chilled carcass, kg	211,57±1,98	224,17±2,04*
Output, %	54,41	55,86
Weight of internal raw fat, kg	9,12±0,13	11,48±0,10
Output of raw fat, %	2,34	2,86
Slaughter weight, кг	220,69±1,76	235,65±1,92
Output, %	56,75	58,72

The study of the morphological composition of the bull-calves carcasses showed that the bull-calves of the experimental group exceeded the analogues of the control group by 13.12 kg, or 7.28% (P>0,99) in weight of chilled carcasses; by 1.14% in meat output; by 0.18 kg, or 0.49% in bones weight; by 0.34% in meat index respectively (table 3).

Table 3: Morphological composition of the bull-calves carcasses (n=3)

Parameter	Experimental groups	
	control	experimental
Weight of chilled carcass, кг	209,36±1,70	222,62±1,88**
Meat weight, кг	167,13±1,18	180,25±1,35**
Meat output, %	79,83	80,97
Weight of bones, кг	36,70±0,36	36,88±0,48
Bones output, %	17,53	16,57
Weight of tendons, кг	5,53±0,07	5,49±0,09
Tendons output, %	2,64	2,46
Meat index, %	4,55	4,89

Samples of the longissimus muscle and the average of the meat samples were selected to determine the effect of innovative fodder additive on the beef quality. The analysis showed that the dry matter content in the average sample of experimental group bull-calves meat was greater in comparison with analogues of the control group by 0.65% (P>0,95); protein – by 0.19%; fat – by 0.38% (P>0,95) respectively.

The dry matter content in the beef, obtained from the bull-calves of the experimental group was greater in comparison with analogues of control group by 1.95% ($P>0,99$), protein – by 1.86% ($P>0,99$) and fat – by 0.09% respectively.

Study of the fatty acid composition of the meat takes a special place among the quality characteristics of the beef. It is well-known that beef contains 52% of saturated acids and 48% of unsaturated, and less than the amount of fatty acids in triglycerides.

It was established during our research that there were more contained fatty acids in the beef obtained from the bull-calves of the experimental group, such as the following: caprylic (C8:0) (1.24%), which is more in comparison with the control group by 0.67%; palmitic (C16:0) (3.17%) – by 0.43%; myristic (C14:0) (2,15%) – by 1.11%; cis-10-pentadecenoic (C15:1) (31,79%) – by 1.15%; oleic (C18:1) (27,22%) – by 4.96%; linoleic (C18:2) (1,75%) – by 0.24%; eicosapentaenoic (C20:5) (0,69%) – by 0.44%; gondoic (C20:1) (2,36%) – by 1.39%; erucic (C22:1) (1,32%) – by 0.81% respectively.

Thus, the fat, obtained from the experimental group bull-calves has an advantage in comparison with the same from the control group in range of saturated, monounsaturated and polyunsaturated fatty acids, which characterizes it as the most easily digestible from a physiological point of view due to the higher content of the studied acids in it.

CONCLUSION

The introduction of a new fodder additive named «KoreMix» helps to increase the meat productivity of Kalmykian breed bull-calves and significantly improves the slaughter and quality characteristics of beef. The high efficiency of the fodder additive can be explained by the action of biogenic silicium, which contributes to the normalization of metabolic processes, occurring in the bodies of the animals, as well as affecting the increase in live weight, growth rate and beef slaughter characteristics and fat quality parameters.

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