

COMPARATIVE CHARACTERISTICS OF THE GROWTH RATE IN TRADITIONAL AND FEEDING CALVES FOR BEEF TECHNOLOGIES

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Abstract

The use of the technology with feeding calves for beef based on a high-concentration type of feeding (59-61% of the energy nutritional value) on Aberdeen-Angus calves led to an increase in the meat productivity of animals in comparison with the control group kept under the traditional feeding system adopted for beef cattle "cow-calf". At the same time, during the period of growing and fattening (3-12 months), the average daily gain in live weight of bulls in the experimental group was 1359 g, which was 30% higher than these indicators in the control group, and was accompanied by an increase in the absolute gain in live weight of young animals by 81.4 kg as well as slaughter yield by 3.6%. The use of the technology with feeding calves for beef based on the high-concentration type of feeding (65-70% of the energy nutritional value) on Holstein calves led to an increase in the meat productivity of animals in comparison with the control group kept under the traditional feeding system adopted for young dairy cattle with a level of concentrates in the diets more than 50%. At the same time, for the period of growing and fattening (3-12 months), the average daily gain in live weight of bulls in the experimental group was 1359 g, which was 47% higher than these indicators in the control group, and was accompanied by an increase in the absolute gain in live weight of young animals by 120 kg, as well as slaughter yield by 3.1%.

Key words: Aberdeen-Angus calves, age, average daily live weight gain, concentrates, fattening, Holstein calves, slaughter yield.

INTRODUCTION

At present, the genetic potential of growing animals, regardless of the direction of productivity, is not fully disclosed, which requires study on the basis of the use of intensive feeding methods.

To realize the growth potential of young animals, it is necessary to create comfortable conditions for keeping and, above all, feeding, which should be not only complete, but also as abundant as possible at all stages of development.

In this situation, the axiom is simple, the earlier the young are accustomed to the abundant consumption of feed, the higher the intensity of its growth, which serves as the basis for high meat productivity. The technology of feeding calves for beef is based on this principle. However, it is practically impossible to increase the increase in live weight of animals, especially ruminants, by simply increasing the consumed feed. Therefore, the feed used must contain physiologically justified norms for the content of nutrients and we are talking

primarily about concentrated feed, which are carriers of exchangeable protein and energy necessary for an intensive synthesis of muscle tissue, which ultimately allows you to get valuable young beef. In this case, it is necessary

Feeding calves for fattening calves involves training animals from an early age to a high consumption of concentrates with free access to feed. This is an unconventional approach to feeding ruminants. However, such a reception is justified during the formation of the proventriculus, which leads to a shift in the development of cicatricial digestion towards rennet digestion of nutrients. It is especially important to use feeding calves for beef technology in the absence of pastures, land for the preparation of voluminous feed, with the availability of feed additives, grain purchased or self-produced feed. In the available scientific literature, there is very little data on the effect of feeding a large amount of concentrated feed (more than 50% of the total nutritional value of the diet), especially in a comparative aspect, taking into account the direction of productivity

of fattened livestock. Therefore, high-concentration fattening as a way to increase the meat productivity of fattened animals is gaining even greater interest for science and production throughout the Russian Federation. Thus, to realize the genetic potential inherent in dairy and beef breeds of cattle potential, a scientific substantiation of feeding is required, taking into account the physiological characteristics of the growth and development of young animals (Fisinin, 2003; Strekozov et al., 2006; Amerkhanov et al., 2011)

MATERIALS AND METHODS

The research and production experience was carried out in the conditions of the enterprise LLC "Agrofirma Myaskom" of the Nizhny Novgorod region on bulls of the Holstein and Aberdeen Angus breeds. Before the start of the experiment, four groups of calves at the age of three months, 15 heads in each group, were formed on the principle of analogous pairs. Holstein calves were kept loose in group pens. Aberdeen-Angus calves from three to six months of age were kept in the generally accepted conditions for beef cattle, in feeding areas year-round according to the "cow-calf" system. Holstein bull calves of the control group were fed according to the traditional feeding technology adopted for young dairy breeds, according to which the level of concentrates in the diet was in the range of 43-46%. Young animals of the experimental group were fed intensively on the basis of feeding calves for beef technology on high-concentration rations with a concentrate level of 65-70%. Aberdeen-Angus calves were fed according to the traditional scheme: up to 5 months of age on suckling under cows and then after weaning - loosely in pens. At the same time, the share of concentrated feed, depending on the age of the young, was 36-38% of the total nutritional value of the diet. In the experimental group, bulls had free access to separate feeding of concentrates and bulk feeds, as a result of which the level of concentrated feed in the rations was high and amounted to 59-61%. The experiment lasted 9 months.

Watering of animals was organized from group auto-drinkers with heating. The distribution of hay was carried out in group feeders and nurseries. Access to voluminous feed and compound feed was free, with a gradual increase in the level of feed concentrates.

Before the start of the experiment, for the calves of the control groups, feeding rations and compound feed recipes were developed taking into account the age of the animals. To increase the consumption of concentrates, high-protein feeds (fish meal, dry milk, sunflower meal, feed yeast, extruded peas) were added to the composition of the feed of the experimental groups, especially at the beginning of the experiment, with the addition of a premix, flavoring additives, feed chalk. The calculation of rations was carried out using the "Futter-KRS" program. To control the physiological state, blood was taken from the jugular vein in which biochemical parameters were determined. At the end of the experiment, at the age of 12 months, a control slaughter of bulls was carried out.

RESULTS AND DISCUSSION

In the conducted studies, it was found that 6 months old Holstein bulls of the experimental group in terms of live weight significantly exceeded the control animals by 33.6 kg or 22.8% ($P < 0.001$). At the same time, the average daily gain in live weight for this period of time was 1523 g in the experimental group, which was 1.6 times higher than in the control (Table 1). The use of intensive technology for fattening bull calves on rations with a high level of concentrates in the experimental group made it possible to bring the animals to slaughter conditions at the age of 12 months. As a result, the live weight of bulls at the end of feeding was 445.3 kg, while in the control this indicator was 37.2% lower and amounted to 324.6 kg with a traditional feeding system. The results of our research on the growth rate of Holstein bull calves on diets with different levels of concentrates are consistent with the data of British scientists (Rutherford et al., 2020).

Table 1. Comparative characteristics of the growth dynamics of calves of different breeds

Indicator	Holstein breed		Aberdeen Angus breed	
	Traditional fattening (the control)	Feeding calves for beef (experience)	Traditional Fattening (the control)	Feeding calves for beef (experience)
Live weight, kg: at the age of 3 months	68.5 ± 1.9	68.8 ± 1.7	86.8 ± 3.2	86.0 ± 2.8 x
at the age of 5 months in % to control	118.8 ± 3.1 100.0	135.1 ± 3.3 113.7	144.7 ± 5.0 100.0	154.6 ± 5.3x 106.8
average daily gain, g in % to control	838 100	1105 131.9	964 ± 56.7 100.0	1143 ± 53.7 * 118.4
at the age of 6 months in % to control	147.2 ± 4.2 100	180.8 ± 5.9** 122.8	174.4 ± 5.8 100.0	195.8 ± 6.2 * x 112.3
average daily gain, g in % to control	947 100	1523 x 160.8	991 ± 45.3 100.0	1373 ± 55.0 ** 138.7
at the age of 9 months in % to control	228.7 ± 5.3 100	314.8 ± 6.6** 137.6	270.0 ± 6.3 100.0	327.2 ± 8.1 ** 121.2
average daily gain, g in % to control	906 100	1489 164.3	1062 ± 45.1 100	1460 ± 51.3 ** 137.5
at the age of 12 months. in % to control	324.6 ± 9.6 100	445.3 ± 11.5** 137.2	372.2 ± 8.0 100.0	452.8 ± 9.8 ** 121.7
average daily gain, g in % to control	1065 ± 32.9 100.0	1450 136.2	1136 ± 40.1 100.0	1396 ± 42.4 ** 122.8
During the experience: absolute gain, kg				
average daily gain, g in % to control	256.1 ± 7.1 902 100	376.5 ± 11.2 ** 1326** 147	282.4 ± 7.9 1045 ± 29.1 100.0	366.8 ± 8.8 ** 1359 ± 32.5 ** 130.0

Note: * P < 0.05 ** P < 0.001 - significance of differences to traditional feeding;

* P < 0.01 - the significance of differences for feeding calves for beef.

Aberdeen-Angus calves of the experimental group at the age of 6 months in live weight exceeded the control animals by 21.4 kg or 12.3%. At the same time, the average daily gain in live weight for this period of time was 1373 g in the experimental group, which was 38.5% higher than in the control (P < 0.01). The bulls of the experimental group at the age of 9 months in live weight exceeded their peers from the control (P < 0.001) by 57.2 kg or 21.2%. The average daily gain was 1460 g in the experimental group, which is 37.4% higher. The same dynamics of growth persisted in the following months of feeding.

At the end of the experiment, the live weight of bulls in the experimental group reached slaughter conditions at the level of 452.8 kg, which was 21.7% higher than this indicator in the control. At the same time, the average daily gain in live weight for the entire experiment in the control group was 1045 g, which was 30%

lower than in the experimental group, the gain in which was 1359 g (P < 0.001). The results of our research on the growth rate of Aberdeen-Angus calves in the control group are consistent with the literature data (Bychkov, 2011; Saenko et al., 2016; Shevkhuzhev et al., 2015), in which it was found that with traditional feeding, the live weight of calves raised in different climatic zones of the Russian Federation with different feeding conditions at the age of 12-13 months varied from 363 to 398 kg.

Despite the fact that the bulls of both groups with the feeding calves for beef technology had a high meat productivity, the superiority in live weight in the Aberdeen Angus bulls in comparison with the Holstein bulls was noted both initially and throughout the entire experiment. At the beginning of fattening at the age of 3 to 6 months, the live weight of the Aberdeen-Angus bulls significantly exceeded

their peers of the Holstein breed by 14.4 ($P<0.01$) and 8.3% ($P<0.05$), respectively. In other periods of growth, no significant difference was obtained. The dynamics of animal growth showed that the maximum average daily gain in live weight during calves fattening in Holstein bull calves (1523 g) was established at the age of 6 months, in Aberdeen Angus bull calves at 9 months (1460 g). It should be noted that in a comparative aspect, the growth rate of Holstein calves was generally somewhat higher than their peers, they were more efficiently fed by feeding for beef breeders than young beef cattle. This is evidenced by the fact that the average daily gain in live weight during fattening of Holstein calves was 47% higher in comparison with

traditional feeding, and in Aberdeen Angus breed it was 30%. According to the literature, specialized meat breeds are characterized by increased early maturity and have higher meat productivity and slaughter yield compared to other combined or dairy breeds (Dunin, 2014; Tikhomirova et al., 2014). At the same time, it has been scientifically proven that with intensive feeding technologies, young dairy breeds are not inferior in productivity to meat breeds (Legoshin & Sharafeeva, 2013).

Meat productivity largely depends on the amount of concentrated feed consumed. The average daily consumption of compound feed by calves of both groups in feeding calves for beef increased with age in comparison with control (Table 2).

Table 2. Feed consumption during the experiment

Indicator	Holstein breed		Aberdeen Angus breed	
	Traditional fattening (the control)	Feeding calves for beef (experience)	Traditional fattening (the control)	Feeding calves for beef (experience)
Consumption of compound feed during the experiment for 1 head:				
total (from 3 to 12 months), kg	635	1561	438	1137
on average per day, kg	2.4	5.8	1.6	4.2
Consumption of voluminous feed during the experiment for 1 head:				
total (from 3 to 12 months), kg	1973	1883	2310	2100
on average per day, kg	7.3	7.0	12.8	11.6

The average daily consumption of compound feed by bulls increased with age from 1.9 to 7.0 kg in Holstein bull calves and from 1.2 to 6.2 kg in Aberdeen Angus bull calves. At the same time, during the experiment, Holstein calves consumed 1.4 times more concentrates than Aberdeen-Angus calves. On average, the consumption of concentrated feed by Holstein and Aberdeen Angus calves was 5.8 and 4.2 kg. High consumption of compound feed led to the saturation of the body with the main nutrients during feeding calves for beef, which in turn led to a decrease in the consumption of bulky feed compared to the control group. In a comparative aspect between breeds, it was found that, regardless of the method of feeding, Holstein bulls tend to consume more concentrates and eat less voluminous feed than animals of the Aberdeen Angus breed. Thus, with traditional and feeding calves for beef,

Holstein bulls consumed 45 and 37.3% more concentrates, and, on the contrary, voluminous fodder was 17.1 and 11.5% less than Aberdeen Angus bulls. Consequently, beef cattle consume and utilize voluminous feed more efficiently, but less concentrated than dairy cattle.

According to a number of scientists, it has been established that gradual adaptation to high consumption of concentrated feed does not have a negative effect on the body of young ruminants and can significantly increase the meat productivity of fattening cattle (Galochkina, 2013; Kharitonov, 2015; Ruppe, 1984; Mendel, 1987). The results of the analysis of the blood of bulls, obtained in our studies, confirmed this fact. With feeding calves for beef, a higher level of protein metabolism is observed, which led to an increase in blood total protein by 4.9-5.7% ($P<0.05$) in comparison with the control (Table 3).

Table 3. Biochemical parameters of blood

Indicator	Holstein breed		Aberdeen Angus breed	
	Traditional fattening (the control)	Feeding calves for beef (experience)	Traditional fattening (the control)	Feeding calves for beef (experience)
Total protein, g / l	63.5 ± 0.9	67.1 ± 1.1 *	73.5 ± 0.9	77.1 ± 0.9 *
Glucose, mmol / l	56.6 ± 0.8	58.3 ± 0.9	54.7 ± 0.8	58.0 ± 0.8 *
Calcium, mmol / l	2.8 ± 0.1	3.2 ± 0.1 ***	12.4 ± 0.17	12.8 ± 0.3
Phosphorus, mmol / l	1.8 ± 0.04	2.0 ± 0.05 **	5.7 ± 0.2	6.0 ± 0.2

Note: *P <0.05; **P <0.01; ***P <0.001- the importance of differences to traditional feeding

Comparative analysis of animal slaughter data indicates that when fattening, bulls of dairy and meat breeds are capable of reaching high slaughter rates by the age of 12 months.

However, in terms of slaughter indicators, Holstein calves were inferior to Aberdeen-Angus calves, regardless of the feeding method (Table 4).

Table 4. Comparative indicators of slaughter of calves of different breeds

Indicator	Holstein breed		Aberdeen Angus breed	
	Traditional fattening (the control)	Feeding calves for beef (experience)	Traditional fattening (the control)	Feeding calves for beef (experience)
Pre-slaughter weight, kg	315.5 ± 5.7	436.7 ± 7.5*	370.7 ± 8.7	449.4 ± 9.8 * x
Slaughter weight, kg	177.9 ± 3.2	259.8 ± 4.3*	220.2 ± 5.3	283.0 ± 6.9 * x
Lethal output,%	56.4	59.5	59.4	63.0 * x
Class	"Good"	"Extra"	"Excellent"	"Prima"

Note: *P <0.001 - the significance of the differences to traditional feeding;

* P <0.01 - the significance of differences in feeding calves for beef.

At the same time, the slaughter weight of meat calves with traditional and feeding calves for beef was significantly higher by 17.5 and 9.2% compared to dairy calves (P<0.01). The slaughter yield of the Aberdeen-Angus calves was also 3-3.5% higher (P<0.05) than that of the Holstein calves.

CONCLUSIONS

In the conducted studies, it was found that feeding calves for beef with a high level of concentrate consumption leads to an increase in the growth rate of Holstein and Aberdeen Angus calves compared to traditional feeding by 47 and 30%, respectively. Feeding calves for beef technology, due to the implementation of the high genetic potential for the growth of young animals, can significantly increase the meat productivity of bulls, regardless of breed, and get a high-value product - young beef at the age of 12 months, which is 4-6 months earlier than the accepted deadlines for the delivery of animals for slaughter.

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