

# Effect of antioxidant on productivity of black-and-white cattle

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## Abstract.

The research duties have carried out studying the effect with the dihydroquercetin using in quantity 25 mg per each 100 kg of body-weight during the feeding process: both in mixture with concentrated feeds and in the form of a natural feed additive in the cattle feeding diets. Research analyzed productive qualities of black-motley breed cattle in the Udmurt Republic conditions. At the first stage of the research was studied the formation black-motley bulls meat production during using dihydroquercetin in the diet in the mixture with concentrated feeds, in the second stage - using a natural supplement enriched with dihydroquercetin. According to the results of the first and second research stages, at the third stage was studied the formation of the black and motley breed cow-heifer's milk productivity during the using a natural feed supplement enriched with dihydroquercetin in the feeding diets during start of production period. Using of dihydroquercetin at the first stage of the study in a mixture with concentrated feeds promoted the production of heavier carcasses in the experimental group up to 244.2 kg. The use of a natural supplement enriched with dihydroquercetin promoted that the heavier carcasses were 243.7 kg at the experimental group. Bulls of the experimental group, having the highest slaughter weight of 256.9 kg, significantly exceeded the average control data by 10.3% ( $P \geq 0.99$ ), with a slaughter output of 56.9%. The use of natural feed additive by cow-heifers promoted the growth of milk productivity in the expansion period by 3.1%.

**Key word:** productivity, cattle, antioxidant, indicator, meat

## INTRODUCTION.

In modern cattle breeding, much attention paid to the provision of animal's balanced nutrition. It is possible to increase the animal's productivity and effectively feed conversion while using scientifically based feeding systems. Today, highly productive animals are observed with unnaturally intensive metabolism, increased requirements for the quality of feed and the full value of feeding [1,2,3]. In the feeding process, the compound substances that affect the animal's organism are not isolated from each other. To increase the productive effect of feeds it is recommended to enrich them with biologically active substances, which significantly increases their rational use [4]. Local and foreign experience of biologically active substances in animal husbandry convinces us that a promising direction is the use of natural compounds that have a wide range of action and lack a number of shortcomings [5]. Among the natural compounds that attract the attention of many scientist, include the reference bioflavonoid - dihydroquercetin (DKV). This substance is isolated from the cell panels of Siberian and Dahurian larch. Dihydroquercetin is a natural antioxidant. It has a high activity even at low concentrations in the range 0.0001-0.00001%.

The biological properties dihydroquercetin usage is particularly relevant for the production of livestock products. The available data of dihydroquercetin antioxidant usage in cattle feed rations diets require clarification, since the scientific basis for the effectiveness of its application in the milk and beef production technology has not been sufficiently studied. An investigation of the DKV effect at the cattle organism in general and, in particular, at animals productivity is relevant [6,7].

Antioxidants usage, which make an important and multifaceted role in the animal live, is a new direction in cattle husbandry. The results of local and foreign studies indicate that the antioxidants usage in animal husbandry allows more efficient feed nutrients usage and lower feed costs per one production item. The antioxidants adding into the mixed feed contributes to the reduction of oxidative processes in the organism, ensures young animals low mortality, increases their live body-weight, general resistance and animals productivity [8,9]. Due to this, the need for a deep studying of the antioxidants effect at the metabolism and animal's productivity including cattle husbandry have a big theoretical and practical importance.

Therefore, our scientific job the aim is to study the different

methods dihydroquercetin usage influence in black-motley cattle breed feed diets and to the productive animals qualities.

## MATERIAL AND METHODS.

Scientific research jobs were made at the Udmurt Republic farms. For various ways studying of dihydroquercetin usage in the cattle feeding rations, scientific experiments were carried out consistently in three stages. At the first and second stage, was studied the formation of the fattening young animals meat productivity. In the first stage, dihydroquercetin was used in a mixture with concentrated feed, in the second stage - a natural feed supplement with dihydroquercetin. Based on the obtained results, a third research stage was conducted to study the effect of a natural feed supplement with dihydroquercetin to the cow-heifers milk productivity at the start of production. For each stage of the experiments were selected 20 animals formed according to the analog principle in two groups (control and experimental group with 10 animals) (Table 1).

At the first and second stages of the research job were selected black-motley breed fattening bulls at the age of 3 months. In the third stage were selected cows-heifers. All animals were in the equal conditions of growing and feeding. Feed diet constructed by the account of the general nutritional diet value for metabolizable energy, conversional protein, fiber, sugar, calcium, phosphorus, carotene, according to detailed standards constructed by the account of the chemical composition of local feeds. In the control groups during research stages the feeding diet formed due to general husbandry diet. In the experimental groups a general husbandry diet + dihydroquercetin (DKV) mixed with concentrated feed or in the form of a natural feed supplement. DKV is a biologically active substance, produced by ZAO Ametis in Blagoveshchensk. Dihydroquercetin is a fine-grained structure powder and the daily dose of its feeding during our research was 25 mg per 100 kg of bodyweight. The composition of the natural feed additive is a feeding salt and dihydroquercetin (purity 92%). Dihydroquercetin as in a mixture with concentrated feeds and in the form of a natural feed supplement fed to the fattening animal starting from the age of 3 months up to time be sent for slaughtering. Cows-heifers fed by natural feed additives in a month after calving in order to form more homogeneous groups for productivity during the next three months in the first half of the day. Slaughtering markers of experimental bull were studied

based on control slaughter data according to the VNIIMS method (1984) at the slaughtering plants conditions. Cows-heifers milk productivity evaluated during control milking operation. The main quality milk markers: the mass fraction of fat – (Gerber acid method (GOST 5867-90)); mass fraction of the total protein (refract metric method by the AM-2 device, (GOST 25179-90)) were studied in the laboratory "Biochemistry of milk and meat" belonging to the department "Livestock processing products technology" of Izhevsk Agricultural academy. The research results were processed biometrically using the methods of variation statistics using personal computers and Microsoft Office 2003-2007 programs; Microsoft Office Word and Microsoft Office Excel.

In the biometric processing of the experiment the arithmetic mean and error were determined, the criterion for the reliability of the difference in the mean indices for the group (td) and the significance level (p) for the Student-Fisher, for which the following notations were adopted as: \* -  $P \geq 0.95$ ; \*\* -  $P \geq 0.99$ , \*\*\* -  $P \geq 0.999$ .

### RESULTS AND DISCUSSION.

Based on the research results (Table 2), we note that the dihydroquercetin using at the first research stage in a mixture with concentrated feed promoted the production of heavier carcasses in the experimental group up to 244.2 kg, which is significantly higher than in the control group by 19.6 kg ( $P \geq 0.999$ ).

The live bodyweight of the experienced bulls at the end of the period of final fattening contributed to a greater accumulation of internal fat. The biggest amount of internal fat 13.5 kg was in bull's carcasses, which fed dihydroquercetin in their diet. The minimum amount of internal fat of 10.3 kg was in control carcasses of slaughtered animals. The slaughter weight of fattening bulls consuming dihydroquercetin was the highest value as 257.8 kg, which is 23 kg ( $P \geq 0.999$ ) higher than the control index, with the largest slaughter yield - 56.7%.

The first stage obtained results educed the thorough analysis feasibility of the natural antioxidant dihydroquercetin in cattle breeding technology using.

Due to the extremely small dihydroquercetin dosage, we created a natural feed supplement enriched with a natural antioxidant -

dihydroquercetin. Since dihydroquercetin is a powder of a finely divided structure, and the daily dose of its feeding is 25 mg per 100 kg of live weight, it is to a degree that it is more difficult to distribute this antioxidant in the production conditions of the first stage of the research. Due to this, in the laboratory conditions, the optimized dihydroquercetin using form is the adding form based on the feeding salt. The natural feed additive effect to the meat and milk productivity researched at the second and third stages. The bull's control slaughter results at the second researching stage found that according to the pre-slaughter live bodyweight 451.7 kg the excess was 28.5 kg (6.7%) ( $P \geq 0.99$ ). Heavier bulls carcasses 243.7 kg were in the experimental group. The experimental group bulls exceed control group up to 23.6 kg (9.6%) ( $P \geq 0.99$ ). The high bodyweight formed both due to the intensive muscle mass and fat formation what was 13.2 kg more compared to a control group 10.1 kg value. The carcass weight and internal fat have a close relationship with the value of the slaughter mass. Experimental group bulls having higher slaughter weight 256.9 kg was reliably higher to the 26.7 kg (10.3%) ( $P \geq 0.99$ ). The third stage researching results found that during analyzed period increased milk productivity of cow-heifers in the experimental group. After three months research the experimental group's cows produced 3.1% milk more than control group cows. Milk protein content of the test animal group was 0.15% higher than in control group what indicates to body metabolic processes improvement. The milk fat content of the control group animals was 3.66% while in the experimental group was slight increase of the milk fat content in milk by 0.20%.

Scientific research results found that dihydroquercetin using (purity of 92%) in black-motley breed bulls feeding diets from the age of 3 months to slaughter period in amount of 25 mg per each 100 kg bodyweight provoking a stimulating effect and the intensive formation of meat production and accelerated metabolic processes in the body. Dihydroquercetin added in a mixture with concentrated feed and with natural feeding salt. Using natural feed additive during the feeding in feed rations dihydroquercetin in its composition with a feeding norm 25 mg per each 100 kg of live bodyweight has a positive effect to the cow-heifer's milk productivity and milk quality.

**Table 1 - Researching groups animals feed diets**

Research stages	Groups content	Groups	n	Feed diet
first	Fettering young males age from 3 month up to 17 month	Control	10	Main feed diet (MFD)
		Trial	10	MFD + dihydroquercetin 25 mg per each 100 kg of body weight in mixture of concentrated feed
Control		10	Main feed diet (MFD)	
Trial		10	MFD + dihydroquercetin 25 mg per each 100 kg of body weight in mixture with food salt as feed adding	
second	Cows-heifers at the start of production	Control	10	Main feed diet (MFD)
Trial		10	MFD + dihydroquercetin 25 mg per each 100 kg of body weight in mixture with food salt as feed adding	

**Table 2 - Results of control slaughter of bull-calves**

Item	1-st research stage		2-nd research stage	
	Dihydroquercetin in mixture with concentrated feed		Natural feed supplement with dihydroquercetin	
	Control group	Trial group	Control group	Trial group
Body weight before slaughtering, kg	432,9±3,4	454,5±3,1***	423,2±3,3	451,7±3,1**
Hot carcass weight, kg	224,6±2,9	244,2±2,7***	220,1±2,7	243,7±2,5**
Carcass yield, %	51,9±0,32	53,7±0,21**	52,0±0,31	53,9±0,22**
Visceral fat, kr	10,3±0,43	13,5±0,48*	10,1±0,42	13,2±0,43**
Slaughtering weight, kg	234,8±3,2	257,8±3,0***	230,2±3,2	256,9±3,3**
Slaughtering yield, %	54,2±0,35	56,7±0,41**	54,3±0,37	56,9±0,45**

\* -  $P \geq 0,95$ ; \*\* -  $P \geq 0,99$ ; \*\*\* -  $P \geq 0,999$

**CONCLUSION.**

The studies carried out have made it possible to determine the positive dihydroquercetin effect to the different metabolic processes in the animal's organism, the intensity of their growth, the meat productivity of fattening bulls, cow-heifers milk productivity and the milk quality. The obtained results confirmed dihydroquercetin advisability using in black-motley breed cattle feed rations. Taking into consideration very small dihydroquercetin dosage this natural feed supplement can be used in animal daily feeding rations without hindering specialists from their work. The functionality of the natural feed additive with dihydroquercetin is quite high; this is confirmed by the results of the second and third scientific research stages.

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