

Cow productivity depending on the energy level of their feeding

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Abstract. This article presents the results of a scientific and economic experiment conducted on lactating cows of Holstein black-and-white breed during the second lactation period, in which the effect of increased energy levels of feeding dairy cows on their productivity was studied. Based on the conducted studies, it was revealed that an increase in the energy level of feeding lactating cows of the experimental group in the second lactation period by 33.3 MJ of metabolic energy due to a decrease in the yield of corn silage and concentrated feed, the replacement of mixed hay with alfalfa hay and the introduction of long-term grass haylage into the feeding diet contributed to a better consumption of metabolic energy by 31.3 MJ, dry matter – by 5.2 kg, crude protein – by 997 g, including digestible protein – by 613 g, crude fiber – by 1594 g, crude fat – by 237 g, sugar – by 553 g, compared with lactating cows of the control group. This led to an increase in gross milk production during the second lactation period in lactating cows of the experimental group by 275 kg, an increase in the fat content in milk by 0.02% and protein by 0.03%, respectively, then in lactating cows of the control group. One energy feed unit in the feeding diet of lactating cows of the control group accounted for 12.3 g less digestible protein than in the experimental group. The consumption of concentrates per 1 kg of milk in the control group was 25% higher than in the experimental group.

1 Introduction

In areas of developed dairy cattle breeding, it is impossible to achieve maximum cow productivity without organizing a good feed base, full-fledged animal feeding and the use of highly effective methods to improve feed quality and feeding levels. To achieve the genetic potential of dairy productivity at the level of 8000-10000 kg per lactation by cows of the Holstein black-and-white breed, which is the most common breed in farms of the Non-Chernozem zone of the Russian Federation, it is necessary to organize full-fledged feeding of animals throughout the entire period of economic use of animals, provided that their health is maintained at a high level and the necessary level of reproduction is ensured [1-10,12].

Due to the fact that the issues of increasing the efficiency of milk production depending on the conditions of an increased energy level of feeding lactating cows in the second lacta-

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tion period have not been sufficiently studied, the purpose of the work was to identify the effect of the energy level of feeding lactating cows in the second lactation period on their productivity in the Non-Chernozem zone of the Russian Federation.

2 Materials and methods of research

To study the effect of the energy level of feeding lactating cows in the second lactation period on their milk productivity level, we formed two groups of animals of 20 heads each in the conditions of the breeding reproducer of Russian Milk LLC in the Bryansk region. The selection of lactating cows into groups was carried out using the method of pairs of analogues. The animals were selected considering body weight, age, productivity and calving time [11].

In accordance with the scheme of the experiment (Table 1), the first group of cows was a control and received the basic ration adopted by the farm. The basic ration was designed for a cow with an average live weight of 550 kg with a milk yield of 28 kg of milk and balanced in basic nutrients, according to current Russian Academy of Agricultural Sciences standards [7].

The second group of cows is experimental, during the experiment they received a ration designed for the second lactation period (the period of peak lactation from 101 days to 200 days of lactation).

Table 1. Scheme of experiment.

Groups	Number of animals	Breed	Average live weight, kg	Average milk yield for the last lactation, kg	Feeding conditions
1 -control	20	holstinized black-and-white	543,3±21,4	28,2±4,8	BR (basic ration)
2- experimental	20	holstinized black-and-white	542,7±21,8	28,1±5,2	Recommended feeding ration
Analysis of research results.					
Conclusions and practical suggestions.					

During the experiment, the cows were kept tethered on concrete floors with tile coating. During all physiological periods, cows used 1.5-2 hours of passive exercise daily.

The productivity of cows was considered 2 times a month according to the results of control milkings, according to which the yield per day, per month and per period was calculated.

The digital material was processed using a PC, and the Student-Fisher criterion was used to identify statistically significant differences [11].

3 The results and their discussion

Feeding of lactating cows during this period is carried out according to productivity, to fully utilize the genetic potential of the animals.

The feeding ration of lactating cows of the control group included the following feeds: 5 kg of mixed hay, 30 kg of corn silage, 11.1 kg of a mixture of concentrates: 4 kg of barley, 4 kg of soft wheat, 1.1 kg of sunflower cake, 2 kg of molasses, and 137 g of fine salt (Table 2). A multicomponent feed mixture was prepared from the above-mentioned feeds, which was distribut-

ed to experimental animals using a mixer feeder twice a day (at the rate of 23 kg in the morning and 23.3 kg in the evening).

Table 2. Feeding ration of experimental animals.

Feed	standard	Group	
		control	experimental
Mixed grass hay, kg		5	-
Alfalfa hay, kg		-	4.8
Corn silage, kg		30	14
Haylage of perennial herbs, kg		-	22
Barley grain, kg		4	3.5
Grain of soft wheat, kg		4	3
Sunflower cake, kg		1.1	1.1
Molasses, kg		2	2.0
Fine salt, g	145	137	145
The feed contains:			
Energy feed unit	21.6	22.16	25.5
Energy feed unit , MJ	216	221.6	254.9
Dry matter, kg	20.6	21.2	26.4
Crude protein, g	3128	2967	3963
Digestible protein, g	2130	1969	2582
Raw fiber, g	4000	3760	5354
Crude fat, g	740	655	892
Sugar, g	2200	1660	2213
Concentration of energy feed unit in 1 kg of dry matter	1.03	0.96	1.08
Amount of digestible protein per 1 energy feed unit, g	98.6	89	101.3
Sugar-protein ratio	1.03	0.84	0.86

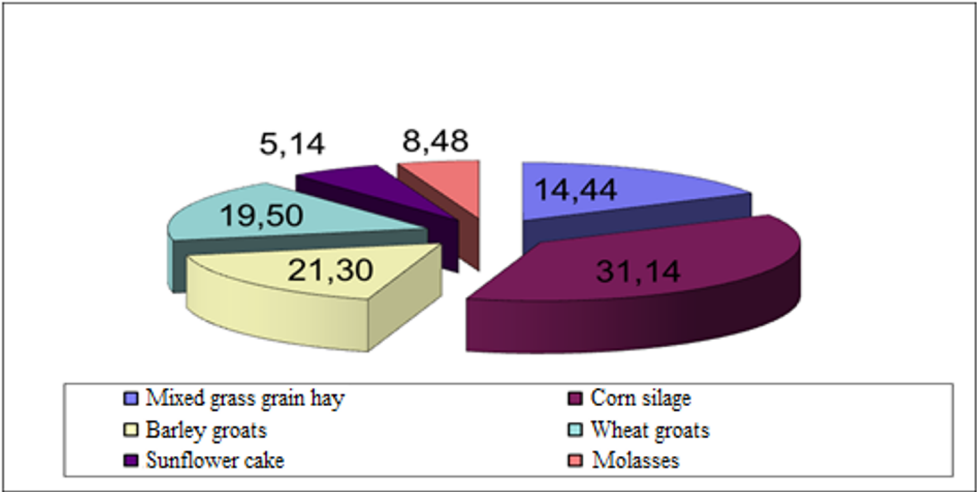


Fig. 1. The structure of the feeding ration of lactating cows of the control group during the second lactation period, %.

In the structure of the feeding ration of lactating cows of the control group, bulky feed accounted for 55.88%, including coarse feed – 14.44%, juicy – 31.14% and a mixture of concentrates – 44.12% (Fig. 1).

During this lactation period, some changes were made to the feeding ration of lactat-

ing cows of the experimental group in terms of distribution and the amount of feed, so instead of mixed grass hay, alfalfa hay was introduced, 22 kg of hay from perennial grasses were included, corn silage was reduced from 30 kg to 14 kg, barley groats – by 0.5 kg, wheat groats – by 1 kg. A multicomponent feed mixture was prepared from them, consisting of: 4.8 kg of alfalfa hay, 14 kg of corn silage, 22 kg of haylage from perennial grasses, 9.6 kg of a mixture of concentrates: 3.5 kg of barley, 3 kg of soft wheat, 1.1 kg of sunflower cake, 2 kg of feed molasses and 145 g of fine salt, which was also distributed by mobile feed dispenser (25.3 kg in the morning, 25.3 kg in the evening).

The level of nutrients in this diet for almost the entire nutrient complex corresponded to the recommended feeding standards, the lack of individual minerals and vitamins was balanced by appropriate additives, which were also added to the multicomponent mixture: 100 g of videin, 100 g of microvit, 101 g of monosodium phosphate, 18 mg of potassium iodide, 52 mg of sulfur cobalt, 753 mg of manganese sulfate, 3 g of zinc sulfate.

According to the structure of the ration of the experimental group cows, coarse feed accounts for 12.62%, juicy – 46.29% and concentrated - 41.09% (Fig. 2).

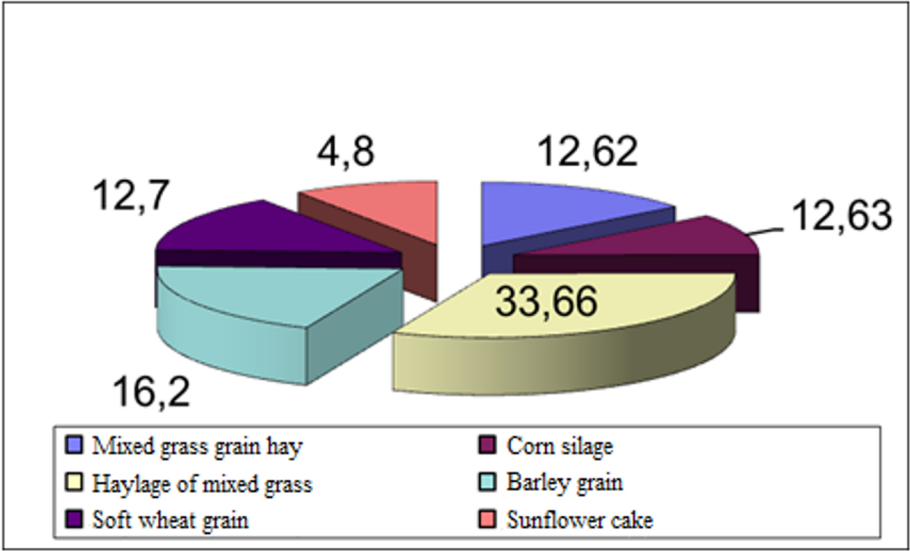


Fig. 2. The structure of the feeding ration of lactating cows of the experimental group during the second lactation period, %.

In both groups, the second phase of lactation was characterized by a concentrated type of feeding.

The energy level of lactating cows feeding in the experimental group was 15.03% higher than that of their counterparts in the control group. The animals of the experimental group consumed more metabolic energy by 31.3 MJ, dry matter – by 24.5%, crude protein – by 33.6%, including digestible protein – by 31.1%, crude fiber – by 42.4%, crude fat – by 36.1%, sugar – by 33.3%, compared with lactating cows of the control group.

In the experiment, depending on the increased energy level of feeding cows during the second lactation period, milk productivity was different. During the fourth month of lactation, more milk was received from lactating cows of the experimental group than from lactating cows of the control group by 10.8%, for the fifth month – by 11% and for the sixth month – by 15.6%.

During the second lactation period, 275 kg more milk was produced from lactating cows of the experimental group, and in terms of fat and protein content in milk, lactating

cows of the experimental group also exceeded lactating cows of the control group by 0.02% and 0.03%, respectively.

Feed costs during the experiment period per lactating cow in the control group amounted to 2,216 energy feed unit, 2,120 kg of dry matter and 196.9 kg of digestible protein, and in the experimental group – 2,548.7 energy feed unit, 2,640 kg DM and 258.2 kg of digestible protein, respectively. 89 g of digestible protein per 1 energy feed unit of the feeding ration of lactating cows in the control group, and 101.3 g of digestible protein in the experimental group.

0.88 kg energy feed units were spent on the production of 1 kg of milk in the control group during the period of the experiment, and 0.91 kg energy feed units in the experimental group. The consumption of concentrates per 1 kg of milk in the control group was 362 g, and in the experimental group – 272 g.

4 Conclusion

Thus, an increase in the energy level of feeding lactating cows in the second lactation period by an average of 15.03%, compared with lactating cows of the control group, contributed to an increase in milk production during the second lactation period by 10.9%, an increase in fat and protein content in milk by 0.02% and 0.03%, respectively.

References

1. I.V. Malyavko, V.A. Malyavko, Bulletin of the Bryansk State Agricultural Academy, **3(79)** 38-42, 2020.
2. I.V. Malyavko, V.A. Malyavko, *The balance and use of calcium by first-pregnant cows during the milking period with their advanced feeding in the pre-pregnancy period*, Materials of the international scientific and practical conference on May 28-29, 2020, (Bryansk: Publishing House of the Bryansk State Agrarian University, 2020) 293-298.
3. V.A. Malyavko, V.N. Masalov, I.V. Malyavko, L.N. Gamko, Bulletin of the Orel State Agrarian University, **1(28)** 22-25 (2011).
4. L.N. Gamko, E.A. Lemesh, A.V. Kubyshkin, O.N. Budnikova, Bulletin of the Bryansk State Agricultural Academy, **2(78)** 24-27 (2020).
5. V.A. Malyavko, I.V. Malyavko, *The importance of the feed base in increasing the productivity of cows*, In the collection: Current problems of veterinary medicine and intensive animal husbandry collection of scientific papers. Faculty of Veterinary Medicine and Biotechnology, (Bryansk: Publishing House of the Buryat State Agricultural Academy, 2013) 185-189.
6. L.N. Gamko, V.E. Podolnikov, I.V. Malyavko, G.G. Nuriev, A.T. Mysik, Zootechny, **5** 6-7 (2016).
7. G.G. Nuriev, L.N. Gamko, I.V. Malyavko, S.I. Shepelev, V.E. Podolnikov, N.V. Samburov, A.A. Taldykina, *Feeding and reproduction of highly productive dairy cows*, (Bryansk: Publishing House Bryansk State Agrarian University, 2016) 95.
8. E.A. Lemesh, A.N. Gulakov, S.I. Shepelev, The effect of a feed additive on the productivity of lactating cows, *Bulletin of the Bryansk State Agricultural Academy*, **6(100)** 57-60 (2023).
9. V.E. Podolnikov, L.N. Gamko, A.G. Menyakina, Bulletin of the Bryansk State Agricultural Academy, **3(97)** 26-30 (2023).
10. S.I. Shepelev, S.E. Yakovleva, E.A. Lemesh, V.A. Streltsov, *Izvestiya of Orenburgsk State Agrarian University*, **2(100)** 270-276 (2023).

11. I.V. Malyavko, L.N. Gamko, V.A. Malyavko, V.E. Podolnikov, A.N. Gulakov, *Modern methods and fundamentals of scientific research in animal husbandry*, (St. Petersburg: Lan, 2022) 189.
12. V.A. Streltsov, I.V. Malyavko, A.E. Ryabicheva, E.A. Lemesh, *Zootechny Magazine*, **4** 21-23 (2021).