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SELECTION AND EVALUATION OF FEED ADDITIVES IN FEEDING SIMMENTAL COWS

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ANNOTATION

This study investigates the chemical composition and nutritional value of feed additives (Vilofoss, Likra, and Profat) used in dairy cow rations. Laboratory analyses were conducted at the State Scientific Center for Quality and Circulation Control of Veterinary Drugs and Feed Additives under the Veterinary and Livestock Development Committee of the Republic of Uzbekistan. Based on the primary chemical analysis results, the nutrient content and metabolizable energy of feeds and feed additives were calculated and balanced rations were formulated. The metabolizable energy (ME) values were determined according to the 2008 All-Russian Research Institute of Animal Husbandry guidelines using standardized equations depending on feed type. Energy values were expressed in International System (SI) units (MJ) and converted into Energy Feed Units (EFU), where 1 EFU equals 10 MJ of metabolizable energy. The results showed

that all analyzed feeds met zootechnical and veterinary requirements in terms of chemical composition and energy value. Nitrogen-free extract substances constituted 51,5-81,4% of the total metabolizable energy. The average nutritional values (EFU) of the main feeds were: alfalfa hay - 0,71; corn silage - 0,21; fodder beet - 0,08; alfalfa haylage - 0,36; wheat straw - 0,66; wheat grain - 1,06; barley grain - 0,97; compound feed (BDK) - 0,97 EFU. The obtained results confirm that determining feed nutritional value based on primary laboratory chemical analysis provides more accurate and scientifically substantiated ration formulation for dairy cattle.

Keywords: Feed additives, Vilofoss, Likra, Profat, chemical composition, metabolizable energy, energy feed unit (EFU), dairy cows, nitrogen-free extract, ration formulation, feed evaluation, laboratory analysis.

Main research findings. Numerous studies conducted by scientists from different countries have demonstrated the maximum effectiveness of complete ration enrichment, which makes it possible to achieve optimal practical results from their use. A review of the scientific literature confirms the necessity and effectiveness of Vilofos feed additives in animal nutrition. Currently available sources include studies devoted to evaluating the effects of various Vilofos feed additives on the productive traits and productivity directions of young cattle of different ages (G.M. Volodkina et al., 2009; E.V. Andreeva, 2010; O.Yu. Yunusova, V.O. Sokolov, 2011; Z.Ya. Nikitina et al., 2015; Z.V.; I.R. Fakhretdinov et al., 2017; N.M. Gubaydullin et al., 2018); dairy cows (Yu.A. Kozub et al., 2008; A.N. Kozlovsky et al., 2010; N.A. Andreeva, E.Yu. Nemtseva, 2017; S.A. Nizhnik et al., 2017; O.V. Senchenko et al., 2017; R.M.R. Khalirakhmonov, 2017; Saifullin et al., 2018; and others, 2018); sheep (T.B.

Sboyeva et al., 2005; B.T. Abilov et al., 2016; V.I. Trukhachev et al., 2017; K.E. Khalgaeva et al., 2017; A.K. Natyrov, K.E. Khalgaeva, 2018); pigs (S.Yu. Smolentsev, 2010; N.A. Andreeva, 2015; V. Chirkov, 2016); and behavioral characteristics (V.G. Lunitsyn et al., 2011). Research conducted by scientists of our republic - Sh.A. Akmalkhonov, M.E. Ashirov, U.N. Nosirov, I. Maqsudov, B.U. Khidirov, U.Sh. Ballasov, B.M. Ashirov, X. G‘iyosov, and others - has determined the effectiveness of improving the Simmental breed and utilizing its genetic potential in crossbreeding programs. The results of their studies indicate that Simmental cattle, regardless of breeding region, function as an improving breed. These findings demonstrate the significant practical importance of using Simmental cattle both in pure breeding and crossbreeding for the establishment of highly productive breeding farms, improvement of local breeds’ productive traits, and development of new types and herds.

INTRODUCTION

Dairy cattle breeding is a leading sector of livestock production in the Republic, accounting for the major share of domestically produced milk and beef. The Resolution of the President of the Republic of Uzbekistan No. PQ-120 dated February 8, 2022, “On Approval of the Program for the Development of the Livestock Sector and Its Branches in the Republic of Uzbekistan for 2022–2026,” as well as Resolution No. PQ-121 dated February 8, 2022, “On Additional Measures for Further Development of Livestock Production and Strengthening the Feed Base,” represent important strategic documents aimed at accelerating the development of the livestock industry.

Furthermore, the Presidential Decree No. PF-60 dated January 28, 2022, “On the Development Strategy of the New Uzbekistan for 2022-2026,” defines priority objectives for the agricultural sector. In particular, Goals 30 and 32 of the

Development Strategy emphasize the scientific and intensive development of agriculture to at least double farmers' incomes, ensure annual agricultural growth of no less than 5%, expand the livestock feed base, and increase production volumes by 1.5-2 times.

MATERIALS AND METHODS

Objective of the study. The objective of the research was to increase the productivity of Simmental dairy cows under the conditions of Tashkent region by applying different doses of the balanced feed complex Vilofoss in their rations.

Research tasks. The main tasks of the study were: to determine the effect of different doses of the balanced feed complex on feed and nutrient intake in the ration, to evaluate its influence on cows' exterior characteristics, to assess its impact on milk productivity, to study its effect on udder morphological traits, to analyze the chemical composition, physicochemical and technological properties of milk, and to evaluate the economic efficiency of applying different levels of the balanced complex "Vilofoss".

Research methods. During the study, zootechnical (milk yield, milk quality indicators, exterior traits, udder characteristics, fertility, feed-to-milk conversion efficiency), biological (clinical parameters, hematological indicators, heat tolerance index), and statistical methods (arithmetic mean and standard error, coefficient of variation, and significance of differences between groups) were applied. Milk fat content of cows in the experimental groups was determined monthly for each cow using the Gerber method. Milk protein content was measured monthly using the Laktan M-4 analyzer. The live weight of Simmental cows was individually recorded using scales up to the third month of the first

lactation, based on MOL-2 record cards. Milk productivity was determined over 305 days of lactation through control milking conducted every ten days. Primary experimental data were processed biometrically according to the method of E.K. Merkureva (1970).

Scientific novelty of the study: For the first time, under the climatic and feed-base conditions of Uzbekistan, the optimal dosage of the Vilofoss protein-mineral supplement for feeding Simmental dairy cows was determined. It was established that feeding with Vilofoss positively influences the chemical composition of milk produced by Simmental cows. Vilofoss supplementation was recommended as an effective means of preventing metabolic disorders occurring during lactation, such as hypocalcemia, ketosis, and acidosis. The Vilofoss-enriched ration was adapted to the existing feed base of Uzbekistan (hay, silage, grain, and feed additives). The relationship between lactation performance, exterior traits, udder morphology, and feed-to-milk conversion efficiency with milk productivity levels was determined. The economic efficiency of Vilofoss supplementation was evaluated, demonstrating that the additional daily cost per cow resulted in increased income from additional milk production.

RESULTS AND DISCUSSION

Study of the Composition of Vilofoss, Likra, and Profat feed additives

During the experimental period, the chemical composition and nutritional value of several feed additives used in dairy cow rations were analyzed at the State Scientific Center for Quality and Circulation Control of Veterinary Drugs and Feed Additives under the Veterinary and Livestock Development Committee of the Republic of Uzbekistan.

Based on the primary chemical analysis results obtained from the laboratory of the State Scientific Center, the content of available nutrients in the feeds was calculated and balanced rations were formulated accordingly. The chemical composition of the feed additives is presented in Table 1.

The obtained data indicate that the quality of the feeds prepared for dairy cows on the experimental farm complied with established standards. The results of the chemical analysis confirm that the studied feeds met zootechnical requirements. The nutritional value and chemical composition of the feeds included in the ration are presented in Table 2.

Table 1. Chemical Composition of Feeds, %

Feeds	Dry Matter	Crude Protein	Crude Fat	Crude Fiber	Ash	NFE*
Corn silage %	23,54	6,56	1,74	35,85	8,12	47,73
Alfalfa hay %	82,55	14,41	1,65	32,34	10,45	41,15
Fodder beet %	7,8	7,24	5,43	9,78	16,54	61,01
Alfalfa haylage %	45,7	13,08	2,23	32,86	14,75	37,08
Wheat straw %	86,2	8,19	1,85	32,61	12,32	45,03
Wheat grain %	86,35	7,87	2,41	6,99	5,01	77,72

Note: NFE – Nitrogen-Free Extract substances.

Since the 1990s, in the territory of the former Soviet Union, it has been recommended that the value of feeds and feed additives be determined using the International System of Units (SI), expressed in joules, and presented in terms of Energy Feed Units (EFU). Taking this into account, the nutritional value of the feeds used at the enterprise was calculated in Energy Feed Units based on their

nutrient content, according to the 2008 guidelines of the All-Russian Research Institute of Livestock entitled "Guidelines for Calculating Metabolizable Energy in Feeds for Cattle, Sheep, and Pigs Based on Nutrient Content."

Table 2. Chemical composition of feed additives

№	Parameter	Obtained results		
		Vilofoss	Likra	Profat
1	Vitamin A	4 684 325 ME	844 553 ME	-
2	Vitamin D_3	2 005 456 ME	151 228 ME	-
3	Vitamin E	38 156,24 mg/kg	5 122 mg/kg	-
4	Vitamin B_2	2 897,06 mg/kg	13,04 mg/kg	-
5	Vitamin B_{12}	6 728,233 mg/kg	-	-
6	Vitamin K_3	1 050,541mg/kg	4,231 mg/kg	-
7	Choline chloride	163 000 mg/kg	-	-
8	Nicotinic acid	24 066,202mg/kg	88,23 mg/kg	-
9	Vitamin B_1	922,147 mg/kg	10,422mg/kg	-
10	Vitamin B_5	-	59,206 mg/kg	-
11	Vitamin B_6	1 788,22 mg/kg	9,32 mg/kg	-
12	Folic acid	652,224 mg/kg	9 662,823 mg/kg	-
13	Biotin	87 558,556 mg/kg	-	-
14	Iron (Fe)	11 950,98 mg/kg	-	-
15	Copper (Cu)	2 166,478 mg/kg	-	-
16	Manganese (Mn)	39 575,23 mg/kg	-	-
17	Zinc (Zn)	27 661,41 mg/kg		
18	Selenium (Se)	109,4 mg/kg	30,662 mg/kg	
19	Cobalt (Co)	43,6191 mg/kg	18,8704 mg/kg	
20	Iodine (I)	432,216 mg/kg	88,26 mg/kg	
21	Calcium (Ca)	-	3,4%	1,52%
22	Magnesium (Mg)	-	8,9%	-
23	Crude ash	-	-	8.95%
24	Moisture	-	-	2%
25	Crude protein	29,4%	2,60%	1,9%
26	Crude fat	14,05%	16,6%	4,75%

According to this guideline, the following equations were applied for cattle:

Green forages (natural and cultivated pastures, grasslands, etc.):

AE = 0.017264 × CP + 0.022874 × CFat + 0.003833 × CFiber + 0.011353 × NFE

Roughages (hay, haylage, straw, silage with about 50% moisture, etc.):

AE = 0.021448 × CP + 0.022583 × CFat + 0.001497 × CFiber + 0.011299 × NFE

Succulent feeds (root crops, silage with more than 50% moisture):

AE = 0.01486 × CP + 0.012728 × CFat + 0.0044 × CFiber + 0.01278 × NFE

Concentrate feeds (cereal and legume grains, meals, flour):

AE = 0.021098 × CP + 0.021532 × CFat − 0.00159 × CFiber + 0.012906 × NFE

Technical by-products of processing industries (oilcakes, meals, distillers grains, bran, dried root residues, etc.):

AE = 0.018789 × CP + 0.013435 × CFat + 0.004658 × CFiber + 0.01023 × NFE

Animal- and microorganism-origin feeds (milk, meat, fish products, yeasts, etc.):

AE = 0.025029 × CP + 0.020237 × CFat + 0.006512 × CFiber + 0.006383 × NFE

Where, per 1 kg of feed (in grams): AE – metabolizable energy; CP – crude protein; CFat – crude fat; CFiber – crude fiber; NFE – nitrogen-free extract.

Considering that 1 Energy Feed Unit (EFU) is equivalent to an average of 2,500 kcal (10.467 MJ), or rounded to 10 MJ of metabolizable energy, the obtained AE values were divided by 10 to determine the nutritional value of farm feeds (see Table 2).

The results showed that all feeds were prepared in high quality and fully met zootechnical and veterinary requirements in terms of metabolizable energy content. Nitrogen-free extract substances accounted for 51.5–81.4% of the total metabolizable energy of the feeds.

In conclusion, determining the nutritional value of feeds and feed additives based on primary chemical analysis conducted at the “Zamona Rano” LLC laboratory

is more substantiated and accurate compared to traditional evaluation methods. The average nutritional values of the available feeds at the farm were as follows: alfalfa hay – 0.71 EFU; corn silage – 0.21 EFU; fodder beet – 0.08 EFU; alfalfa haylage – 0.36 EFU; wheat straw – 0.66 EFU; wheat grain – 1.06 EFU; barley grain – 0.97 EFU; compound feed BDK – 0.97 EFU.

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