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CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF THE FEED USED IN DAIRY COW FEEDING IN THE REPUBLIC OF MOLDOVA

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Abstract. Information on nutritive value of locally available feed ingredients is scarce, therefore the study conducted in the laboratory of the Department “General Animal Husbandry” of the State Agrarian University of Moldova, was aimed at determining the chemical composition and nutrient content of various feeds and fodder species commonly used in the diets of dairy cows raised in the University farm. Fodder samples, proceeding from different agricultural and ecological zones of the Republic of Moldova, were analyzed for their content of total moisture, dry matter, crude protein, fat, fiber, ash and NFE quantity and the data were compared with those available in the specialized literature. The comparative analysis showed differences in the content of a number of nutrients and large fluctuations were observed in terms of the level of oat nutrition units, energetic nutrition units and metabolizable energy content in comparison with the data contained in normative references and used in the calculation of the nutritional value of feed and diets.

Key words: Feed; Chemical composition; Nutritional value; Dairy cattle breeding.

INTRODUCTION

The main development prospects of dairy cattle breeding industry are the maximization of using genetic characteristics of animals based on economically justified fodder resource use and organization of high-level animal feeding. The development of dairy cattle breeding is impossible without the organization of science-based animal feeding; i.e. it is necessary to meet animals' need in nutrients, knowing their actual content in various fodders. The feeding diet should not only be biologically complete and balanced in all elements, but also cost-effective, that is, it should achieve the minimum cost of the diet.

Country's agriculture, including animal husbandry, depends on the climatic factors and seasonal nature of production and it adapts slower than other industries to the rapidly changing economic environment.

Scientific researches and practice show that the reference data on the nutritive value of fodders do not reflect their actual level and do not take into account their varietal characteristics. Data analysis from a number of laboratories belonging to animal feed industry show a large range of fluctuations, even within the same region (Hohrin, S.N. 2002). Therefore, in the feeding practice there are large deviations from the actual nutritional value of feed, which are caused by the peculiarities of the pedo-climatic zone, the number and types of growth conditions (climate, soil, fertilizers, agricultural machinery), varieties of forage crops, conditions of feed harvesting and storage, growth phase of the crop at harvest, harvesting method, and the storage conditions of the region (Kalašnikov, A.P. et al. 2003; Marnov, D.I. et al. 1982; Šumilin, I.S. et al. 1986).

The monitoring of nutritional value and good quality of fodders is a necessary condition for the intensification of livestock production. In this regard, samples of various feeds and fodder species available in different agricultural and ecological zones of the Republic of Moldova have been analyzed for their chemical composition and nutrient content.

MATERIAL AND METHODS

The aim of the study was to conduct a comparative analysis of the characteristics of the basic feed used in dairy cattle breeding in the Republic of Moldova based on the study of their chemical composition and nutritional value. In order to determine chemical composition and to assess the nutritive value of fodders, fodder samples, commonly used in the diets of dairy cows raised in the farm of the State Agrarian University of Moldova, were selected.

The analysis of selected samples, in order to determine the quantity of “raw” nutrients, was conducted in the laboratory of the Department “General Animal Husbandry” of the State Agrarian University of Moldova using conventional methods of zootechnical analysis (Petuhova, E.A., Bessarabov, R.F. et al. 1982; Smirnova, N.S. 1982). The content of total moisture, crude protein, fat, fiber, ash, and

the quantity of NFE in the feed were determined (Smirnova, N.S. 1982). A comparative analysis of the nutritional value of tested fodders was carried out and it was compared with the data presented in specialized literature (Kalašnikov, A.P. et al. 2003).

RESULTS AND DISCUSSIONS

Analyzing the results of chemical tests of the forages traditionally used in the diets of dairy cattle in the Republic of Moldova it was determined that the level of nutrient content varied in different samples of forages and that it differed from data presented in specialized normative literature.

It was determined that the content of dry matter in the concentrate feeds (spent wash, corn, oat, wheat and sunflower oil cake) ranged from 81.14% in corn spent wash to 88.16% in sunflower oil cake, and it was lower than the figures presented in standard handbooks, where it is 90.0% for each one (tab. 1).

Analyzing the data on raw fat content it was determined that its level in dried wheat spent wash was 8.16%, in corn grain it varied slightly from 3.43 to 3.67%, in oat grain – 2.16%, in wheat – 2.27%, in sunflower oil cake – from 7.97 to 13.22%, in corn green mass – 0.73%, in corn silage – 1.43%, and in hay of different types the content of fat ranged from 1.31 to 2.78%. Thus, the actual fat content in forages differed from the data presented in reference literature, and the difference constituted 7.6, 4.3, 4.0, 2.0, 7.7, 0.6, 1.0 and 2.4%, respectively.

A lower protein content, compared with the specialized literature data, was featured in the dried wheat spent wash – the difference was significant and constituted 13.61%; in the corn grain it was 8.28% compared to 9.2%, in oat grain – 6.33 vs. 10.8%, in wheat grain 10.09 compared to 13.30%, and in sunflower oil cake – from 16.05 to 21.20% compared to 40.50% (fig. 1).

The analysis of laboratory data revealed differences, compared with standard indicators, concerning the content of crude protein in voluminous forages. Thus, it was higher in green mass of corn – 2.50 vs. 2.10%, in corn silage – 3.47 vs. 2.5%, and in hay alfalfa – from 16.5 to 16.6% vs. 14.40%. Large variations of this indicator were observed in the samples of meadow hay – from 5.21 to 12.35% vs. 9.70%.

A productive use of fodders largely depends on the digestibility of nutrients, which are directly determined by the quantity of fiber in the diet. Besides its nutritional value, fiber also has the property of maintaining the necessary consistency of the content of the digestive tract for a normal digestion.

Table 1. Content of raw nutrients in fodders, %

Fodders	Initial moisture	Hygrosopic moisture	Dry matter	Organic matter	Crude protein	Crude fat	Crude cellulose	Crude ash	Crude NFE
Dried wheat waste for alcohol production	9.09	9.77	81.14	78.28	6.49	8.16	12.22	2.86	51.42
Corn grain (1)	9.23	7.45	83.32	82.26	8.28	3.43	3.31	1.06	67.24
Corn grain (2)	9.03	7.51	83.47	82.21	8.28	3.67	2.99	1.26	67.27
Barley grain	7.03	9.72	83.25	80.96	6.33	2.16	9.60	2.29	62.87
Wheat grain	6.39	9.90	83.71	82.28	10.09	2.27	2.34	1.42	67.58
Sunflower oil cake (1)	6.45	5.42	88.13	83.97	16.05	9.27	32.05	4.16	26.60
Sunflower oil cake (2)	7.22	5.23	87.55	79.20	19.60	13.22	32.10	8.35	14.27
Sunflower oil cake (3)	6.25	5.59	88.16	83.49	21.20	7.97	25.57	4.67	28.76
Corn green mass (1)	73.03	2.14	24.83	23.50	2.50	0.73	6.57	1.33	13.70
Corn green mass (2)	71.46	2.23	26.31	25.04	2.47	0.73	7.26	1.27	14.58
Corn silage	65.37	3.63	31.00	29.24	3.47	1.43	7.66	1.76	16.68
Alfalfa hay (1)	8.75	6.84	84.41	76.34	16.48	1.98	22.91	8.07	34.97
Alfalfa hay (2)	5.26	6.77	87.97	78.26	16.62	2.78	23.12	9.72	35.75
Meadow hay (1)	7.69	6.67	85.64	77.72	12.35	1.51	28.26	7.93	35.61
Meadow hay (2)	6.25	6.80	86.95	78.68	9.65	1.53	33.74	8.27	33.77
Meadow hay from lowlands	7.69	6.12	86.19	78.70	10.24	2.19	31.15	7.49	35.12
Meadow hay from river banks (1)	7.69	6.23	86.08	80.12	5.21	1.31	34.39	5.96	39.21
Meadow hay from river banks (2)	9.09	6.07	84.84	79.55	7.30	1.54	28.27	5.29	42.45
Barley straw	11.81	5.82	82.37	77.85	5.30	1.63	38.77	4.52	32.15

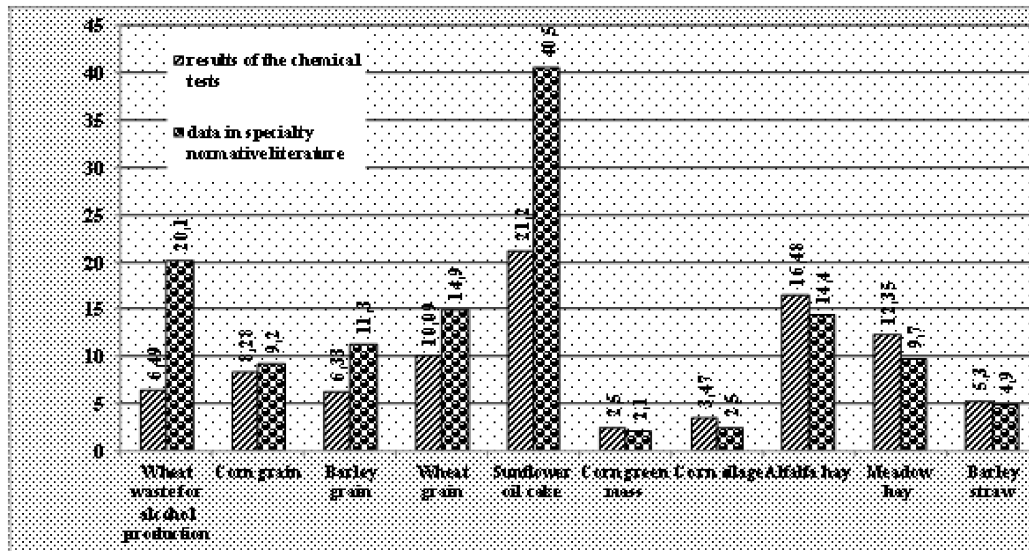


Figure 1. Content of crude protein in the feeds

Based on the chemical analysis of data, it was established that the level of crude fiber content in dried spent wash was 12.22%, in corn grain it varied from 2.99 to 3.31%, in oat grain – 9.60%, in wheat – 2.34%, in sunflower oil cake it varied from 25.57 to 32.10%, in green mass of corn – from 6.57 to 7.26%, in corn silage – 7.96%, and in different types of hay – from 22.91 to 34.39%. Feed analysis data regarding the content of crude fiber differed from the normative data, which are usually used in the calculation of diets for dairy cows. Less crude fiber, in comparison with normative references, was observed in dried wheat spent wash – by 1.72%, in sunflower oil cake depending on the samples – by 3.63 to 4.93 %, in alfalfa hay – by 2.18 to 2.90%. A higher content of crude fiber was observed in grain corn – by 4.3%, in wheat – by 0.64%, in corn green mass – by 1.07 and 1.76%, and in meadow hay – by 1.96 to 7.44. There were no differences in the content of crude fiber in oat grain and silage corn.

Table 2. The nutritional value of feeds

Fodders	ONU	ONU, by Kalashnikov	UNE	UNE, Cattle by Kalashnikov	Metabolic energy, Mj, cattle	Metabolic energy, Mj, cattle, by Kalashnikov
Dried wheat spent wash	1.07	1.11	0.92	1.07	9.18	10.7
Corn grain (1)	1.28	1.33	1.16	1.28	11.64	12.8
Corn grain (2)	1.29	1.33	1.17	1.28	11.68	12.8
Oat grain	0.93	1.00	0.89	0.92	8.90	9.2
Wheat grain	1.17	1.28	1.13	1.08	11.27	10.8
Sunflower oil cake (1)	1.31	1.08	1.22	1.04	12.18	10.4
Sunflower oil cake (2)	1.31	1.08	1.21	1.04	12.11	10.4
Sunflower oil cake (3)	1.29	1.08	1.22	1.04	12.24	10.4
Corn green mass (1)	0.25	0.27	0.26	0.23	2.57	2.3
Corn green mass (2)	0.26	0.27	0.27	0.23	2.73	2.3
Corn silage	0.30	0.20	0.31	0.23	3.12	2.3
Alfalfa hay (1)	0.57	0.44	0.74	0.67	7.36	6.7
Alfalfa hay (2)	0.59	0.44	0.76	0.67	7.58	6.7
Meadow hay (1)	0.49	0.42	0.69	0.69	6.86	6.9
Meadow hay (2)	0.44	0.42	0.68	0.69	6.81	6.9
Meadow hay from lowlands	0.47	0.42	0.69	0.69	6.92	6.9
Meadow hay from river banks (1)	0.45	0.42	0.69	0.69	6.89	6.9
Meadow hay from river banks (2)	0.51	0.42	0.70	0.69	7.01	6.9
Barley straw	0.30	0.34	0.58	0.57	5.82	5.7

The results on calculating the actual nutritional value of fodders in oat nutrition units for cattle, based on the indices of chemical composition, showed some variation in comparison with the data given in normative references (Kalašnikov, A.P. et al. 2003). The nutritional value of oat grain, wheat and green mass of corn almost did not vary (tab. 2, fig. 2).

Metabolizable energy of feed represents the measure of energy availability in the system of animal feeding. Its value depends on the ratio of essential nutrients in the feed, endogenous losses during digestion, the balance of energy and protein supply, which defines the energy loss in the urine and gases. The calculations used to determine the nutritional value of feed in metabolizable energy, allowed to establish their actual nutritional value in terms of the Republic of Moldova.

The metabolizable energy of feed resources was established by calculations using the data on chemical composition of feed, the indices of nutrients' digestibility and the corresponding regression equation. It was found that the metabolizable energy indicators selected for the analysis of cattle feeds also had some differences with the data indicated by Kalashnikov.

Large fluctuations in terms of nutritional value of feed were observed when assessing their energy nutrition units and when the nutritional value was expressed in metabolizable energy for cattle (tab. 2, fig. 3).

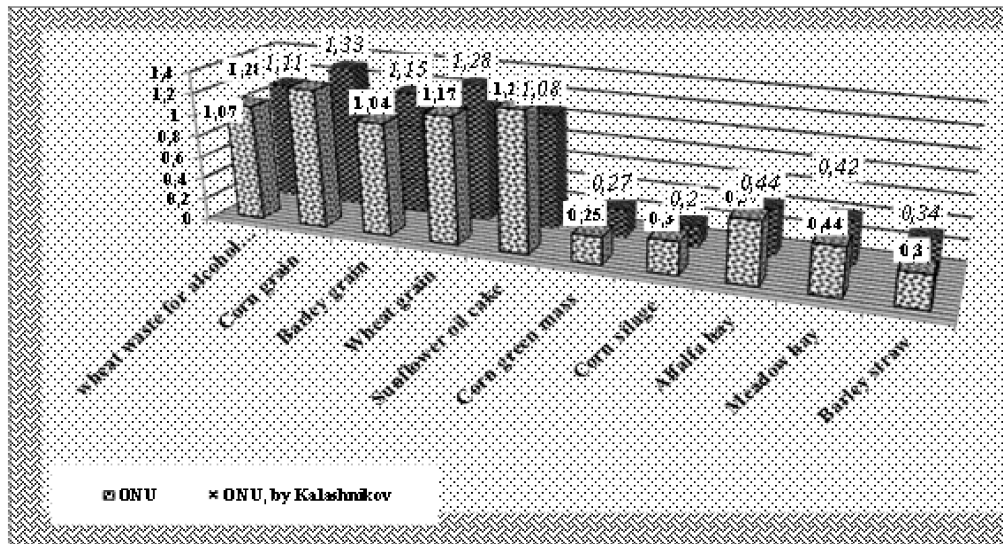


Figure 2. Nutritional value of feed in ONU

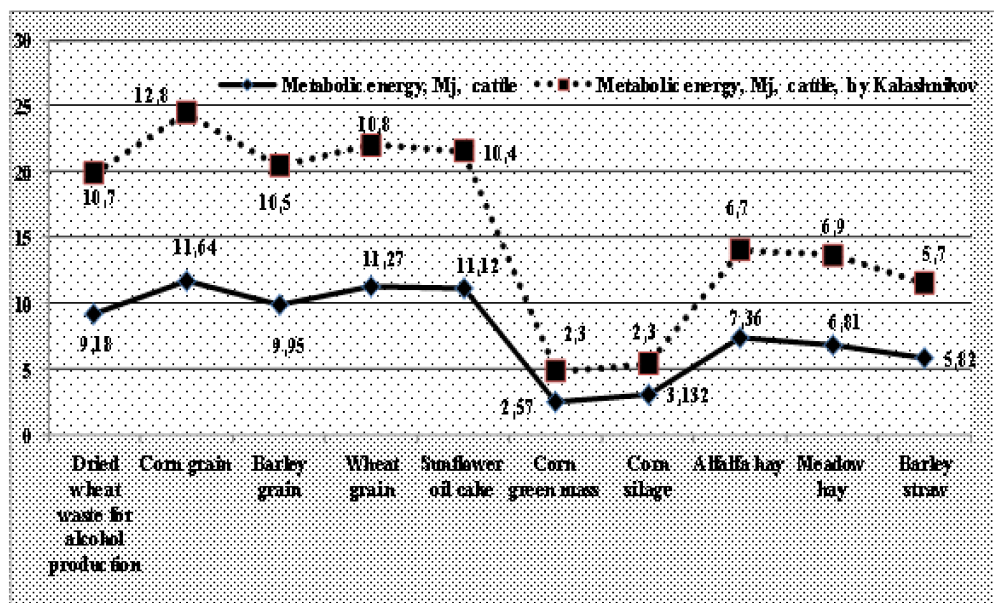


Figure 3. Cattle feed metabolizable energy, Mj

The examination and comparison of chemical composition and nutritional value of some fodders used in the Republic of Moldova showed the mismatch of their composition and nutritional value with the data contained in the normative references and used in the calculation of the nutritional value of feed and diets.

CONCLUSIONS

The study of the chemical analysis of feed used in dairy cow feeding in the Republic of Moldova identified differences in the content of a number of nutrients compared with data presented in normative references.

Nutritional value of dairy cattle feed used in the Republic of Moldova varies according to the level of oat nutrition units, energetic nutrition units and metabolizable energy compared with the information presented in normative references.

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