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USE OF RYE SILAGE AND BREWER'S GRAINS IN DAIRY COW DIETS

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It has been established that the use of wet brewer's grains and rye silage in feeding dairy cows allows to optimize crude protein content and significantly reformulate the daily feeding of protein ingredients of mixed fodder from 130 g/l of milk to 90 g/l of milk, which, provides a significant reduction in the daily cost of the dairy cow's diet accordingly. At the same time, the dry matter content of the diet is reduced to 35.0%, and moister diet is consumed by a cow with increased appetite. In addition, the strong point of diets based on wet brewer's grains and rye silage is the absence of starch in their composition. It allows to ensure the content of total starch at the level of 20.0% of the dry matter of the ration to formulate a complete mixed ration. Even against the background of higher sugar content in rye silage compared to maize silage, such diets have the appropriate total starch + sugar content which prevents metabolic disorders such as acidosis and will have a positive impact on the duration of productive use of cows. Taking into account the mineral and vitamin composition of typical and innovative diets for cows during lactation, it was found that diets based on maize silage and alfalfa haylage contain more natural calcium, phosphorus, magnesium, copper, zinc, as opposed to rations based on rye silage, which are richer in natural sodium, potassium, chlorine, sulfur, iron, manganese, cobalt, selenium and iodine.
Key words: *dairy cows, fodder, compound feed, general analysis, mineral analysis, diet.*

INTRODUCTION

The quantity and quality of fodder is always an urgent issue in livestock breeding as a branch of agricultural production. The lack of which or their inadequate quality often leads to metabolic problems: subclinical acidosis, ketosis, etc. [1, 2], low productivity, reduced fertility, reduced duration of productive use of cows and, as a result, reduced profitability of the final product [3, 4].

ANALYSIS OF CURRENT RESEARCH

Nutrition management needs to be improved [5]. The production of quality milk remains an important issue. The concept of "optimal quality milk" should be understood as milk suitable for cheese production, and the production of "healthy" milk from a healthy cow means compliance with the desired fat: protein ratio, which should be 1.2: 1, which primarily indicates the absence of metabolic disorders in the cow's body such as acidosis, ketosis, etc. It is quite difficult to achieve the required balance between protein and fat in cow's milk without the rational use of fodder in practical production conditions [6].

Maize silage provides high energy intake when used in dairy cow diets [7]. In addition, maize is the third most important crop in terms of the area under cultivation on a world scale, but unfortunately special modelling of the potential current and future climatic distribution of maize at the global level with climate data for the period 2050-2100 shows a loss of climatic suitability for maize cultivation in the near future. Consequently, large areas that are currently suitable for maize cultivation will suffer from heat and drought, which may limit maize production [8].

The analysis of the references indicates the need for additional research on efficient fodder production, until the South of Ukraine is located in a risky land use zone, and recently, against the background of global warming, the situation with the production of sufficient quantity and quality of fodder has only become more difficult.

THE PURPOSE OF THE WORK

Determination of the strategy for the use of feeding rations for dairy cows at different stages of lactation, where classical ingredients (maize silage, alfalfa haylage) and innovative ingredients (rye silage, wet beer pellets) are used as the basic fodder.

MATERIALS AND RESEARCH METHODS

The scientific and economic experiments were conducted in the conditions of the State Enterprise "Andriivske", Bilhorod-Dnistrovskyi District, Odesa Oblast, according to the methods generally accepted in dairy farming [9], and laboratory studies of maize silage and alfalfa haylage samples in the conditions of the specialized laboratory for forage research Frank Wright LTD (Ashbourne, United Kingdom) using the NIRS technique have been used to evaluate the quality of forages [10]. NIRS has been successfully used in the prediction of nutritional value through direct scanning of forage samples [11, 12].

RESULTS OF OWN RESEARCH

The diets of dairy cows of the control group in the first period of lactation contained a typical composition of fodder, and the diets of cows of the experimental groups contained less corn silage, alfalfa haylage or did not contain them at all, but they had wet brewer's grains and rye silage in more or less quantities (Table 1). The use of new diets in the experimental groups allowed to reduce slightly the gross daily amount of feed from 11.3 kg to 9.6-10.9 kg per head, which amounted to 270-310 g per 1 litre of milk. It is worth noting that significant changes occurred in the protein load for the production of 1 litre of milk due to a significant reduction in the amount of sunflower meal and soybean cake from 130 g/ 1 litre of milk in the diet of the experimental group to 90-100 kg/ 1 litre of milk in the diets of the experimental groups. As soybean meal and sunflower meal are necessary at the same time one of the most expensive ingredients, reducing their share in the feed structure allowed to reduce the daily cost of the diet by 21.30 UAH or 13.0%, 27.70 UAH or 16.0%, 31.30 UAH or 19.0% and 31.10 UAH or 18.0%, respectively, for the I, II, III, IV experimental groups compared to the cost of the diet of the control group.

Table 1: **Typical and innovative feeding rations for early lactation cows with a live weight of 600 kg, milk yield - 35 l, BW - 3.8%, BF - 3.16%, BCS - 2.75 points**

Ingredients, kg	**Group of cows**				
	K	**R-1**	**R-2**	**R-3**	**R-4**
Maize silage	25,0	22,0	16,0	12,0	-
Lucerne haylage	8,0	6,0	3,0	-	-
Rye silage	-	-	13,0	25,0	45,0
Lucerne hay	1,5	1,5	1,5	1,5	1,0
Brewer's grains	-	10,0	10,0	10,0	6,0
Compound feed	11,3	10,2	10,1	9,6	10,9
including					
- maize	3,5	3,3	3,5	3,0	3,5
- barley	1,0	1,0	1,0	1,0	2,0
- wheat	2,0	2,0	2,0	2,0	2,0
- sunflower cake	3,0	2,5	2,3	2,3	2,5
- soya meal	1,5	1,1	1,0	1,0	0,6
- salt	0,1	0,1	0,1	0,1	0,1
- feed chalk	0,14	0,16	0,16	0,17	0,19
- MKF	0,02	0,02	0,02	0,02	0,02
- premix for dairy cows	0,04	0,04	0,04	0,04	0,04
Total	**45,8**	**49,7**	**53,6**	**58,1**	**62,9**
The cost of the ration, UAH	168,8	147,5	141,1	137,5	137,7

The nutrient analysis of the typical and innovative diets for cows in the first 100 days of lactation is presented in Table 2. The rations were designed to have a dry matter content of 22.0 kg, and cows could easily consume this amount of dry matter. Due to the increase in the share of wetter feeds in the diets of cows of the experimental groups, the physical weight of the feed tended to increase (from 45.8 kg to 62.9 kg) against the background of a stable content of total dry matter in the diet (22.1-22.4 kg). It is important that the specific proportion of dry matter in the diet from forage feeds corresponded to the norm of a "healthy diet" only in animals of the II and III experimental groups (60.2%, 62.3%, respectively). This is due to the fact that at high milk yields, in order to provide the required level of energy, the amount of

concentrated feed was quite high, but the ratio of dry matter of forage and concentrated feed in the first period of lactation can be 50:50 %. The gross amount of metabolizable energy of the diets, the concentration of metabolizable energy per 1 kg of dry matter of the diet of all experimental groups corresponded to the norm and ensured the production of the planned 35 litres of milk.

The crude protein content was fully within the existing standard - 16.0-18.0 %/kg dry matter of the diet. It is worth noting that this indicator of excess nitrogen from microbial protein in the rumen has a clear upward trend against the background of a proportional increase in the feeding of brewer's grains and rye silage. Thus, the indicator of excess nitrogen from microbial protein in the rumen of cows of the IV experimental group increased by 98 g or 64.5%, reaching the upper limit of the standard, compared to analogues of the control group.

Table 2: **Analysis of nutrients of typical and innovative diets for cows in the first 100 days of lactation (milk yield - 35 l, milk fat - 3.8%, protein content - 3.16%)**

Indicator	Norm	Group of cows				
		К	R-1	R-2	R-3	R-4
Physical weight, kg	-	45,8	49,7	53,6	58,1	62,9
Dry matter, kg	21,0-22,0	22,3	22,1	22,1	22,3	22,4
Dry matter, % of total weight	45,0-55,0	48,6	44,5	41,3	38,4	35,5
Dry matter from forage, kg	12,6-13,2	12,3	13,1	13,3	13,9	12,7
Dry matter from forage, %.	60,0% i >	55,2	59,3	60,2	62,3	56,9
Metabolizable energy / ME, MJ/ kg	262,0	263,0	261,0	261,0	262,0	262,0
ME, MJ/kg DM	11,6-12,1	11,8	11,8	11,8	11,7	11,7
Crude protein, % DM	16,0-18,0	16,0	16,0	16,0	16,1	16,0
Excess nitrogen from DM, g	100,0-250,0	152,0	181,0	191,0	228,0	250,0
Crude fat, % DM	2,0-5,0	3,91	4,27	4,29	4,29	4,17
NDF, % DM	35,0-40,0	30,9	33,9	35,6	37,7	39,4
Starch, % DM	20,0 i <	32,3	30,7	27,7	23,8	20,1
Sugar, % DM	6,0-12,0	2,3	2,1	2,7	3,2	4,1
Starch + sugar, % DM	30,0 i <	34,6	32,8	30,4	27,0	24,2
Acid load	43,0-50,0	45,6	43,3	43,1	43,3	44,4
Fibre index	100,0 -136,0	103	103	108	115	120
NON-FATty acid, g/kg DM	25,0 i <	26,0	24,9	24,2	23,8	22,8
The yield by ME , kg	35,0	35,4	35,0	35,0	35,2	35,2
The yield by MP, kg	35,0	34,0	34,3	34,2	34,3	33,9

The crude fat content in the dry matter of the diet was within the existing standard, but there was a tendency to increase in the diets of all experimental groups without exception by 0.26-0.38% compared to the diet of the control group.

The fibre content of ruminants' diets is critically important for the health of ruminants. Thus, the actual NDF content in the control group's rations was 30.9%, which is 4.1% below the lower limit of the standard. The reason for this is an increase in the amount of concentrated feed in the diet to ensure the required energy level. The use of brewer's grains and rye silage in the diets of cows of the experimental groups contributed to an increase in the NDC content to the existing norm and even to almost the upper limit of the norm (40.0%) in the diet of animals of the IV experimental group (39.4%).

Excessive starch in the ruminant ration reduces feed digestibility and increases the incidence of digestive disorders, leading to metabolic diseases and forced accelerated culling of cows [6]. This indicator is considered both separately and in combination with sugars. If the total content of starch + sugar exceeds 32.0% of the dry matter of the diet, the risk of acidosis increases. Since the use of molasses as an ingredient in dairy cow diets is very rare in southern Ukraine, and other traditional dietary components are low in sugar, there is no excess sugar in the diets. Given the use of corn silage, which is usually rich in starch, and cereal feed ingredients, which are also rich in starch, the excess starch in the diets of cows in the control and experimental groups is due to these circumstances. It is worth noting that the most optimal starch content (20.0% and < of dry matter) was achieved in the diet of the IV experimental group without the use of corn silage, even with the use of an increased amount of feed (more than 10 kg of feed per head per day), that even with the maximum sugar content in dry matter among the diets of all experimental groups, the lowest content of total starch + sugar was achieved in the diet of the IV experimental group.

The acid load on the rumen was within the normal range, but in the diets of the experimental groups these indicators tended to decrease, due to the content of NDF and confirmed by another calculated indicator - the fibre index, which had a clear vector to increase by 5.0-17.0 units in the II-IV experimental groups.

The load of unsaturated fatty acids on the rumen (SFA) affects the fat content of milk and normally amounts to 25.0 g/kg DM of the diet. In the diets of the control group only, this indicator was 1.0 g/kg DM or 4.0% higher than the norm. The lowest content of NPUFA was noted in the diets of cows of the IV experimental group, which is lower than the control by 1.0 g/kg DM of the diet or 4.0%.

Analysis of the mineral composition of typical and innovative diets for cows in the first 100 days of lactation (Table 3) shows that the diets of all experimental groups are balanced in terms of calcium, phosphorus, magnesium, but there is an excess of sodium, potassium, chlorine, iron, copper, manganese, zinc, selenium, iodine, vitamins A, D, E against a slight deficiency of sulfur (control, I-II experimental groups), cobalt.

Table 3: **Analysis of the mineral composition of typical and innovative diets for cows in the first 100 days of lactation**

Indicator	Norm	Group of cows				
		К	R-1	R-2	R-3	R-4
Macroelements:						
Calcium, g	155,8	155,1	155,8	156,2	157,1	167,9
Phosphorus, g	89,1	92,1	90,3	90,5	92,3	91,0
Magnesium, g	55,7	56,5	55,1	55,9	55,7	55,8
Sodium, g	27,6	52,5	50,9	56,4	61,9	70,8
Potassium, g	178,1	271,8	232,5	246,9	265,1	307,4
Chlorine, g	56,31	123,7	120,5	140,1	159,6	191,9
Sulphur, g	44,5	38,6	40,9	43,0	49,6	48,1
Trace elements:						
Iron, mg	884,5	2575,8	2943,0	3659,5	4427,4	5164,9
Copper, mg	400,7	873,9	878,4	877,9	886,5	888,1
Manganese, mg	667,8	2174,5	2126,1	2325,1	2523,9	2939,1
Cobalt, mg	10,0	8,3	7,9	8,2	8,6	9,3
Zinc, mg	1446,9	2965,2	3030,0	2987,3	2964,3	2954,3
Selenium, mg	6,7	8,3	9,8	9,9	9,9	9,3
Iodine, mg	44,5	104,5	103,9	106,4	108,8	112,6
Vitamin A, thousand IU	66,0	198,8	192,9	255,9	314,9	416,2
Vitamin D, thousand IU	18,0	31,3	31,3	31,3	31,3	31,3
Vitamin E, thousand IU	556,5	978,1	942,8	960,4	973,4	1072,4

A similar set of ingredients in the diet of the experimental groups of cows during mid-lactation (Table 4) allowed to reduce the daily amount of concentrated feed to 9.1-9.2 kg/head or 303-307 g/l of milk, but the diets of the experimental groups were cheaper by 13.5-30.9 UAH/day/head.

Table 4. **Typical and innovative diets for feeding cows of middle lactation with a live weight of 600 kg, milk yield - 30 l, fat content - 3.9%, protein content - 3.25%, body fat content - 3.0 units**

Ingredients, kg	Group of cows				
	К	R-1	R-2	R-3	R-4
Maize silage	25,0	22,0	14,0	14,0	-
Lucerne haylage	8,0	4,0	3,0	-	-
Rye silage	-	-	14,0	18,0	40,0
Lucerne hay	1,5	1,5	1,5	1,5	1,5
Brewer's grains	-	8,0	8,0	8,0	8,0
Compound feed	9,2	9,2	9,1	9,1	9,2
incl.					
- maize	2,8	2,5	2,5	2,5	3,3
- barley	0,5	1,2	1,2	1,2	1,3
- wheat	1,2	1,2	1,5	1,7	2,0

- sunflower cake	3,0	3,0	2,8	2,7	1,8
- soya cake	1,5	1,0	0,8	0,7	0,5
- salt	0,08	0,08	0,08	0,08	0,08
- feed chalk	0,1	0,14	0,12	0,15	0,12
- MKF	0,02	0,03	0,03	0,03	0,03
- premix for dairy cows	0,03	0,04	0,04	0,04	0,04
Total	**43,7**	**44,7**	**49,6**	**50,6**	**58,7**
Cost of the ration, UAH	151,9	138,4	132,9	128,7	121,0

Table 5. **Analysis of feeding rations for cows of average lactation with a live weight of 600 kg, milk yield - 30 l, BW - 3.9%, BF - 3.25%, BOD - 3.0 points**

Indicator	**Norm**	**Group of cows**				
		K	**R-1**	**R-2**	**R-3**	**R-4**
Physical weight, kg	-	43,7	44,7	49,6	50,6	58,7
Dry matter, kg	19,4-21,4	20,5	20,3	20,3	20,4	20,5
Dry matter, % of total weight	45,0-55,0	46,8	45,3	40,9	40,4	35,0
Dry matter from forage, kg	11,6-12,8	12,3	12,2	12,3	12,4	12,5
Dry matter from forage, %.	60,0% i >	60,0	60,4	60,9	60,8	61,0
Metabolizable energy / ME, MJ/ kg	236,3	239,0	238,0	237,0	240,0	239,0
ME, MJ/kg DM	11,1-11,7	11,7	11,8	11,7	11,7	11,6
Crude protein, % DM	16,0-18,0	16,0	16,3	16,5	16,0	16,0
Excess nitrogen from DM, g	100,0-250,0	218,0	249,0	258,0	239,0	257,0
Crude fat, % DM	2,0-5,0	3,94	4,29	4,26	4,26	4,18
NDF, % DM	38,0-42,0	32,4	34,6	37,1	37,2	40,2
Starch, % DM	20,0 i <	29,6	29,2	24,9	25,1	19,6
Sugar, % DM	6,0-10,0	2,3	2,1	2,8	2.9	4,0
Starch + sugar, % DM	30,0 i <	31,8	31,3	27,7	28,1	23,6
Acid load	43,0-50,0	44,3	42,5	42,9	43,4	43,6
Fibre index	100,0 -139,0	110	106	113	113	123
NON-FATty acid, g/kg DM	25,0 i <	26,8	26,5	25,1	24,6	21,6
The yield by ME , kg	30,0	30,6	30,3	30,1	30,7	30,5
The yield by MP, kg	30,0	30,0	30,4	30,2	30,2	30,6

Similar patterns of characteristics of feeding diets for middle lactation cows (Table 5) correspond to those previously established in the early lactation period: the physical weight of the diet was increased in the experimental groups due to the use of more moist components, but the indicators of the gross amount of dry matter of the diet and dry matter from forage were identical.

But in general, the rations for mid-lactation cows are easier to balance in terms of all key criteria. At the same time, the dry matter from fodder meets the "healthy diet" - clearly more than 60.0%. The amount of metabolizable energy and its concentration per 1 kg of dry matter, crude protein and crude fat content, acid load on the rumen, fibre index, and the ratio of milk yield from metabolizable energy to milk yield from microbial protein are all within the normal range.

Of course, in general, it is much easier to normalize feeding rations for dairy cows in this period because there is no longer an energy deficit as in early lactation diets, and there is no increased need for concentrated feed.

As for the excess nitrogen from rumen microbial protein, it corresponded to the norm in the diets of the control and I, III experimental groups, but was slightly increased in the diets of II, IV experimental groups, due to the use of brewer's grain and rye silage.

The NDF indicator generally increased in all experimental groups, but fully corresponded to the existing norm only in the diets of animals of the IV experimental group, where the main fodder was rye silage. In addition, only in the diets of this group was it possible to achieve the optimal starch content, which was 10.0% lower than in the diets of the control group, against the background of the maximum sugar content of all experimental groups, which was higher in the diets of the IV experimental group by 1.7% compared to the control.

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content, acid load on the rumen, fiber index, and the ratio of milk yield from metabolizable energy to milk yield from microbial protein are all within the normal range.

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As for the excess nitrogen from rumen microbial protein, it corresponded to the norm in the diets of the control and I, III experimental groups, but was slightly increased in the diets of II, IV experimental groups, due to the use of brewer's grain and rye silage.

The NDF indicator generally increased in all experimental groups, but fully corresponded to the existing norm only in the diets of animals of the IV experimental group, where the main fodder was rye silage. In addition, only in the diets of this group was it possible to achieve the optimal starch content, which was 10.0% lower than in the diets of the control group, against the background of the maximum sugar content of all experimental groups, which was higher in the diets of the IV experimental group by 1.7% compared to the control.

The total content of starch + sugar corresponded to the standard (30.0% and <), which provides a "healthy diet", and hence the productive longevity of cows, in the diets of cows of experimental groups II-IV. A similarly identical pattern was found for the content of NUFAs, which was the lowest in the diets of experimental group IV, i.e. it can be assumed that the highest fat content in milk should be expected in animals of this group.

The analysis of the mineral and vitamin composition of the diets of middle lactation cows proves the similarity of the results obtained in the first 100 days of lactation: the diets of all experimental groups are balanced in terms of calcium, phosphorus, magnesium, selenium, but there is an excess of sodium, potassium, chlorine, iron, copper, manganese, zinc, iodine and vitamins A, D, E against a background of a slight deficiency of sulfur and cobalt.

An analysis of typical and innovative feeding rations for late lactation cows (Table 6) shows that the daily intake of concentrate feed is only 3.3-4.1 kg/head or 220-273 g/l of milk. It is important that the diets of the experimental groups were again cheaper by 8.6-29.1 UAH/day/head compared to the diets of the control group. The use of rye silage and brewer's grains allowed us to reduce the amount of sunflower meal, which led to a significant reduction in the cost of feed. In addition, the amount of daily table salt, chalk and premix was also significantly reduced, and the need for monocalcium phosphate was eliminated due to the sufficient level of phosphorus from the available ingredients.

Table 6**. Typical and innovative feeding rations for late lactation cows with a live weight of 600-650 kg, milk yield - 15 l**

Ingredients, kg	Group of cows				
	K	**R-1**	**R-2**	**R-3**	**R-4**
Maize silage	24,0	23,0	19,0	17,0	-
Alfalfa haylage	10,0	7,0	3,0	-	-
Rye silage	-	-	11,0	15,0	40,0
Alfalfa hay	1,5	1,5	1,0	1,0	1,0
Beer pellets	-	4,0	4,0	4,0	3,0
Mixed fodder	3,3	3,3	3,3	3,6	4,1
incl.					
- - corn	-	-	1,0	1,0	2,5
- - sunflower meal	3,2	3,2	2,2	2,5	1,5
- - salt	0,05	0,05	0,05	0,05	0,05
- - chalk	0,02	0,03	0,06	0,09	0,05
- - premix for dairy cows	0,01	0,01	0,01	0,01	0,01
Total	**38,8**	**38,8**	**41,3**	**40,6**	**48,1**
Cost of the diet, UAH	109,6	101,0	90,6	86,9	80,5

At the same time, dry matter from forage feeds increases from 60.0% of diets in the middle lactation period to 75.2-81.2% in the late lactation period (Table 7). In general, the diets of this period are balanced in terms of the amount of metabolizable energy against the background of its slightly increased concentration per 1 kg of dry matter, balanced in terms of the amount of crude fat, NDF, starch, total starch + sugar, acid load on the rumen, fiber index and NSCP. At the same time, the balance of excess nitrogen from rumen microbial protein was maintained. In the diets of the control and III experimental groups, there

was a slight imbalance between the ratio of milk yield from metabolizable energy to milk yield from microbial protein against the background of a proper balance in the other experimental groups.

The analysis of the mineral and vitamin composition of typical and innovative diets for feeding late lactation cows showed that despite the reduction of the daily premix from 40 to 10 g/head, the diets of all experimental groups are balanced in terms of calcium, phosphorus, magnesium, but there is an excess of sodium, potassium, chlorine, iron, copper, manganese, zinc and vitamins A and E against a background of a slight deficiency of sulphur (control and I-III experimental groups), cobalt, selenium, iodine (control and I-II experimental groups). As for vitamin D, which is also in deficit, it can be produced in the body of animals under the influence of ultraviolet radiation, provided they are in the outdoor areas.

Table 7. **Analysis of feeding diets for late lactation cows with a live weight of 600-650 kg, milk yield - 15 l, BW - 4.0%, BF - 3.3%, BOD - 3.25 points**

Indicator	Norm	Group of cows				
		К	R-1	R-2	R-3	R-4
Physical weight, kg	-	38,8	38,8	41,3	40,6	48,1
Dry matter, kg	14,7-16,7	15,4	15,3	15,0	14,7	14,5
Dry matter, % of total weight	45,0-55,0	39,8	39,4	36,2	36,2	30,2
Dry matter from forage, kg	11,6-12,0	12,5	12,4	12,0	11,5	10,9
Dry matter from forage, %.	60,0% i >	81,2	81,0	80,5	78,2	75,2
Metabolizable energy / ME, MJ/ kg	164,0	170,0	170,0	170,0	168,0	164,0
ME, MJ/kg DM	10,3-10,9	11,0	11,1	11,3	11,4	11,3
Crude protein, % DM	16,0-18,0	15,2	15,7	14,3	14,6	15,1
Excess nitrogen from DM, g	100,0-250,0	244,0	258,0	135,0	167,0	202,0
Crude fat, % DM	2,0-5,0	3,64	3,96	4,01	4,13	4,10
NDF, % DM	40,0-44,0	40,3	41,3	40,8	41,5	45,6
Starch, % DM	20,0 i <	20,5	20,2	21,2	19,8	12,1
Sugar, % DM	6,0-10,0	1,6	1,6	2,2	2,6	4,5
Starch + sugar, % DM	30,0 i <	22,1	21,8	23,4	22,4	16,6
Acid load	43,0-50,0	42,8	41,3	41,9	41,2	40,3
Fibre index	100,0 -155,0	143	139	138	138	150
NON-FATty acid, g/kg DM	25,0 i <	24,9	25,8	23,8	25,2	21,9
The yield by ME , kg	15,0	15,2	16,1	16,1	15,8	15,1
The yield by MP, kg	15,0	14,5	15,6	15,1	14,8	15,4

CONCLUSIONS

1. The use of wet brewer's grains and rye silage in feeding dairy cows allows optimising the crude protein content and significantly reformulating the daily feeding of protein ingredients of mixed fodder from 130 g/l of milk to 90 g/l of milk, which, accordingly, provides a significant reduction in the daily cost of the dairy cow's diet.
2. The use of the above ingredients helps to reduce the moisture content of the total diet and ensures the dry matter content of feed rations at 35.0%, which is, on the one hand, lower than the lower limit of the existing standard, but a wetter diet is consumed by a cow with increased appetite.
3. The strong point of diets based on the use of wet brewer's grains and rye silage is the absence of starch in their composition, which, when formulating a complete mixed diet, allows for a total starch content of 20, 0 % of the dry matter of the diet, and even against the background of increased sugar content in rye silage compared to corn silage, such diets have the proper total starch + sugar content, which prevents metabolic disorders such as acidosis and will positively affect the duration of productive use of cows, and hence the economic indicators of milk production in industrial farms.
4. In general, taking into account the mineral and vitamin composition of typical and innovative cow diets during the entire lactation period, it should be noted that diets based on corn silage and alfalfa haylage contain more natural calcium, phosphorus, magnesium, copper, zinc, as opposed to rations based on rye silage, which are richer in natural sodium, potassium, chlorine, sulphur, iron, manganese, cobalt, selenium and iodine.

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ВИКОРИСТАННЯ ЖИТНЬОГО СИЛОСУ ТА ПИВНОЇ ДРОБИНИ У РАЦІОНАХ ГОДІВЛІ МОЛОЧНИХ КОРІВ

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Встановлено, що використання у годівлі дійних корів вологої пивної дробини та житнього силосу дозволяє оптимізувати показники вмісту сирого протеїну та суттєво переформулювати в сторону зменшення добову даванку білкових інгредієнтів комбікорму з 130 г/ л молока до 90 г/ л молока, що відповідно забезпечує суттєве здешевлення добової вартості раціону годівлі дійної корови. При цьому зменшується вміст сухої речовини раціону до рівня 35,0 % , а більш вологий раціон споживається коровою з підвищеним апетитом. Крім того, сильною стороною раціонів годівлі на основі використання вологої пивної дробини та житнього силосу є відсутність крохмалю у їхньому складі, що при формулюванні повнозмішаного раціону дозволяє забезпечити вміст загального крохмалю на рівні 20,0 % від сухої речовини раціону і навіть на фоні підвищеного вмісту цукрів в житньому силосі порівняно з кукурудзяним силосом такі раціони мають належний сумарний вміст крохмалю + цукру, що профілактує метаболічні розлади на кшталт явища ацидозу та позитивно впливатиме на тривалість продуктивного використання корів. З урахуванням мінерального та вітамінного складу типового та інноваційних раціонів годівлі корів протягом

лактації встановлено, що раціони годівлі в основі яких є кукурудзяний силос та люцерновий сінаж більше містять природнього кальцію, фосфору, магнію, міді, цинку на відміну від раціонів, що базуються на житньому силосі, які більш багаті на природній вміст натрію, калію, хлору, сірки, заліза, марганця, кобальту, селена та йоду.

Ключові слова: *дійні корови, фуражні корми, комбікорм, загальний аналіз, мінеральний аналіз, раціон.*