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EFFECTIVENESS OF UNCONVENTIONAL FODDER USING BY REPAIR HEIFERS FEEDING

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Growth of symbiotic population in rumen microflora, increasing total protein content in blood, particular albumin fraction under optimal conditions of the heifers nutrition ensuring by using of refined mixed fodder and new recipe premix were observed. Rumen and blood metabolic processes optimization by experimental heifers increased daily alive weight to 13,5%, that received extra income 242.68 UAH per animal.

Premix, dried DDGS, metabolic processes of blood and rumen, repair heifers

One of the fundamental factors of livestock production is adherence to balance rations by the most important indicators – energy and protein, which leads to effective use of the genetic potential of animal productivity. Increase the proportion of grain forage and roughage fodder and reduction of complete fodder leads to a fodder over expenditure and reducing their nutritional value.

However, world aggravation of energy problems and competition for the grain leads to increasing demand on food and fodder grains. Thus, Ukrainian mixed fodders consist on 65-70% from grain, while in the countries of EU and in the United States all basic groups mixed fodders for farm animals and poultry average consist only 35-38% from grain products [1]. That significant decreased grain components proportion were possible by using of alternative fodder bases like byproducts processing industry.

In this regard, the problem of rational usage of potentially valuable forage waste is very important, because it leads to significantly reduced costs of livestock forage, provides optimal energy and protein balance rations in those fodder, reducing antropogenig pressure on environment [2]. In our opinion, among the variety of

nontraditional fodder supplements we can note a waste product of alcoholic industry, like dried DDGS. It is a secondary raw resource that can be successfully used for the mixed fodder production and a fodder supplements in the rations of different sex-age and productive livestock groups [2-4].

Dried DDGS is the main by-product of ethyl alcohol production. Its contains nearly 17 different amino acids with their total content 35.6% in terms of absolutely dry matter. Fraction of carbohydrates is average 13.5%, fats – 7.8% and mineral salts – 2.4%. Also there are the full spectrum of vitamins of B group, folic acid, tocopherol, ergosterol – a metabolism regulators in the animal body. Dried DDGS also contains many microelements: iron, zinc, manganese, copper, ets. Depending on their humidity and raw materials for the alcohol production, nutritional value of dried DDGS is between 1.08 to 1.27 fodder units. Because of that studies directed on the searching of rational ways of those waste products usage are very important.

Aim of research –investigate efficiency of the mixed fodder usage with the inclusion of dried DDGS and a new recipe premix on physiological and biochemical processes and productivity of 7 – 12 months aged repair heifers.

Materials and methods. Studies were conducted in experimental farm "Obroshyno" in Lviv region with 2 groups of repair heifers Ukrainian black spotted dairy breed aged 7 – 12 months, a 10 animals in each group, identical by age and body weight. Experiment duration – 120 days. The basic ration of animals in the control group was composed of the mixed silage, forage crops, grass-legume hay, straw, molasses and commercial mixed fodder with premix P 63-2-89. The ration of animals in the experimental group was the same, except mixed fodder in which 15% of the grains was replaced by the same amount (by weight) of dried DDGS. Furthermore premix P 63-2-89 was correction, witch provide requirement of heifers by microelements that deficient in the Carpathian region area (copper, zinc, cobalt, iodine, selenium) and vitamin D.

Rations were balanced according to detailed norms [5]. Chemical composition and nutritional value of fodder defined by conventional methods zootechnical analysis [6]. Control of the live weight dynamics of the heifers was performed

monthly by personal weighing. Investigation material were fodders, blood and rumen content. With the purpose of controlling some aspects of heifer metabolism 3 most expressed analogues in each group of animals were selected tests blood (from the jugular vein) and rumen contents (from the fundal part area after two hours of first morning feeding).

In blood test were determined: the number of red blood cells, hemoglobin content – by using erytrohemometr M-065, blood nitrogen fractions – by Kjeldahl, total serum protein – refractometric, protein fraction – by electrophoresis in agar gels, amine nitrogen - by Meetings and Kaiser, urea – by color reaction with diacetylmonooksim.

In the rumen contents were determined: pH – ionometrically, ammonia – by Conway, nitrogen fractions – by Kjeldahl, amine nitrogen – by Meetings and Kaiser, amylolytic, proteolytic and cellulolytic bacteria content – on selective medium. Obtained digital material statistically processed [7].

Results. Long-term studies of traditional fodder in Western Ukraine reveal their deficiency of essential microelements as copper, zinc, cobalt, iodine, selenium. Therefore of their replenishment by correcting the existing premixes and fodder additives for balancing cattle ration is important. We have developed a mixed fodder formula, in which 15% of grains (wheat – 4, barley – 6, oats – 3, rye – 2 %) were replaced by the same amount (by weight) of dried DDGS.

Premix composition P 63-2-89 was also corrected, which made to possible proved heifers needs for a microelements and vitamin D.

Feeding standard and experimental mixed fodder differently affected on the intensity of metabolic processes in the heifers rumen and blood and their productivity.

Proverbially [8, 9], hydrogen ions concentration (pH) in the rumen specify quantitative and species changes in microflora composition, their activity, formation and utilization of ammonia, organic acids and other important metabolites. Thus, the active acidity level is an integral indicator of the intensity and direction of the fermentation process in the rumen.

In our studies, pH level in the rumen liquid of heifers in experimental group was lower (P <0.05) than in controls (Table. 1), which indicated of higher fermentation intensity. At the same time, the rate of formation and level of ammonia evacuation is one of the important factors that determine the efficiency of nitrogen usage in animals [10, 11].

Indicated decreasing of ammonia nitrogen (P <0.05) in the experimental group of heifers caused by two different factors: effective use of ammonia by microbial populations, evidenced by increasing number of amilo- and cellulolytic bacteria or more intense absorption of ammonia through the rumen wall and its active detoxification in ornityn cycle with further loss with urine [12, 13]. However, considering pH level in the rumen and urea in the blood, absorption activating is unlikely under these conditions.

1. Rates of rumen content at repair heifers (M ± m, n = 3)

Rates	Group	
	control	experimental
pH	6,90±0,02	6,74±0,03*
Ammonia, mg%	10,38±0,71	8,77±0,42*
Amine nitrogen, mg%	2,44±0,02	2,81±0,11**
Nitrogen fractions, mg%		
Overall	86,57±1,07	93,09±1,47**
Residual	23,69±0,07	24,49±0,18**
Protein	62,86±0,99	68,60±1,59
Number of bacteria million / ml:		
amylolytic	10,01±0,22	11,81±0,71*
cellulolytic	6,43±0,76	9,45±0,34**
proteolytic	3,56±0,15	3,67±0,20

Animals of experimental groups indicated lower active acidity index, therefore a significant part of the ammonia molecules remain in ionized form (ammonium ion) and probably slowly adsorbing into the blood and better used by microflora, its confirmed increasing of total and protein nitrogen content (Table. 1). This fact correlate with the lower (P <0.02) urea content in blood of experimental groups of repair heifers, compared to the control (Table. 2). Our data coordinate with studies of authors [13, 14].

Between the concentration of ammonia and amino nitrogen in rumen liquid of experimental heifers a correlative reverse relationship was marked. Animals treated

with an experimental fodder, gained more (P <0.02) free amino acids nitrogen compared to control, which possibly associated with activation of reductive amination of ketoacids processes [15].

2. Physiological and biochemical blood parameters of repair heifers (M ± m, n = 3)

Rates	Group	
	control	experimental
Hemoglobin, g%,	13,00±0,30	13,20±0,13
Red blood cells, m. / Mm^3	7,27±0,33	7,47±0,47
Total protein, g%	7,77±0,09	8,59±0,32*
Albumin, g%	2,51±0,34	3,39±0,03*
Globulin g /%		
α	0,85±0,02	1,18±0,09
β	3,31±0,39	2,56±0,07
γ	1,09±0,07	1,47±0,21*
The protein index, A / T	0,48	0,65
Nitrogen fractions mg%		
overall	1457,57±14,28	1499,25±21,84
residual	59,06±0,60	55,86±1,15*
protein	1396,86±17,15	1443,56±22,18*
Amino nitrogen mg%	2,81±0,16	3,21±0,12*
Urea, ml.mol / l	4,54±0,24	3,80±0,09**

Morphological indicators of animal blood were in the limits of the physiological norm, but in experimental group of animals indicated a tendency to increase the number of red blood cells and hemoglobin saturation. Analysis of protein spectrum in serum showed a significant increase of total protein and albumin fraction (P <0.05) in the blood of experimental animals, that indicated optimization of protein synthesis function in the liver. This in turn led to increasing protein index (35.4%), which indicates the efficiency of protein metabolism in the whole body.

It was shown a direct relationship between the concentration of albumin in the blood – basic plastic material for the synthesis of tissue proteins and average daily live weight gain of heifers (Table. 3).

3. The intensity of growth of repair heifers (M ± m, n = 10)

Rates	Group	
	control	experimental
Duration of period, days,	120	120
Live weight, kg		
at the beginning of the experiment	196,7±8,08	197,6±7,53
at the end of the experiment	268,5±8,78	279,1±6,21

Growth		
general, kg	71,8±4,75	81,7±5,59
average, g	598±39,80	679±46,90
% to control	-	13,5

Average daily live weight gain of heifers in experimental group after 120 days was 679 g and that were 13.5% higher than in controls (598 g).

The economic effect [16] showed that the increasing of average daily live weight gain of heifers in experimental group allowed to receive additional 242.68 UAH per animals compared to the control.

Conclusions and prospects of subsequent researches. Thus, providing repair heifers with necessary nutrients by new premix formulation helped increase number of symbiotic microorganisms in rumen (due to the effective use of ammonia nitrogen), concentration of total protein in blood and its albumin fraction. Optimization of synthetic processes in rumen fluid and blood of heifers led to increase of average of live weight increments by 13.5% compared with the control. Increased average daily live weight increments of heifers in experimental group allowed to receive additional 242.68 UAH per animals.

Further perspective direction is investigating the unconventional fodder efficiency of cattle feeding based from other by-products of processing industry.

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