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Rumen metabolic processes optimization by heifers and their growth intensivity by using of new recipe protein-vitamin-mineral supplement.

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Putting to the feeding of repair heifers aged 14-18 months a new formulated protein-vitamin-mineral supplement balanced their rations for deficient in the Precarpathian area trace elements and fat-soluble vitamins. Optimizing a some aspects of heifers increased daily alive weight to 9.2% compared to the animals of control group.

Repair heifers, premixes, protein-vitamin-mineral supplements, content rumen performance.

Profitability dairy cattle breeding caused by many factors, including timely herd repairing by replacing of old cows to high-born repair heifers [8]. One of the central places in heifers repair growing is a complete feeding animals, including the use of balancing feed additives – protein-vitamin-mineral and protein-fat-mineral supplements, which were made from plant and animal high-protein components in combination with biologically active substances [9, 10].

Therefore instead of different export kinds of the most expensive high-protein supplements, local sources of vegetable protein typical to biogeochemical specifics of the zone, soil and climatic conditions are very attracted. Thus, in the Carpathians in particular special interest feed beans, peas, rape are having. [6, 9, 11].

However, the using to the feeding of repair heifers silage-concentrate ration with the standard mixed fodder and premixes in Western Ukraine in winter-stall period not provided the animals needs of protein, macro and micronutrients, fatsoluble vitamins. In particular, these rations deficiency of protein, phosphorus, sodium, sulphur, copper, zinc, cobalt and iodine and vitamins A and D were observed [1, 13].

Because of that correction feeding Simmental repair heifers in winter-stall period by new protein-vitamin-mineral supplements and premixes is very important.

Aim of research –investigate efficiency of the new protein-vitamin-mineral ration supplement usage as part of silage-concentrate ration on functional activity of rumen microorganisms and productivity of Simmental repair heifers.

Materials and methods. Studies were conducted during December 2012 - March 2013 in experimental farm "Litynske" in Drohobych district Lviv region with 2 groups of repair heifers Simmental dairy breed aged 14 – 18 months, a 10 animals in each group, identical by age and body weight. Experiment duration – 120 days. The technology of retention stall-tethered with motion to the sites. Feeding animals were balanced according to generally accepted standards [8]. The scheme of the experiment is presented in Table 1.

1. Shema experiment

Groups	Number of animals	Periods of experiment	
		egalitarian (25 діб)	main (120 діб)
I (control))	10	Main ration with a standard mixed fodder by standart protein-vitamin-mineral supplement	Main ration with a standard mixed fodder by standart protein-vitamin-mineral supplement
II (experimental)	10	Main ration with a standard mixed fodder by standart protein-vitamin-mineral supplement	Main ration with a standard mixed fodder by optimized protein-vitamin-mineral supplement

In feeding repair heifers used a typical to winter-stall the most farms Precarpathians rations, included silage-concentrate. The structure repair heifers the main diet (OR) included: barley-vetch silage (25% vetch, barley 75%), grass-legume hay (70% cereals, legumes 30%), wheat straw and molasses. In the morning feeding heifers obtained 50% of the total nutritious ration, included mixed fodder, silage, molasses, hay and straw.

In egalitarian period (25 days) both groups of animals were fedding the same ration composition (grass-legume hay, wheat straw, silage vetch-barley, molasses, mixed fodder). Fodder mixed for animals contained barley, wheat, oats, rye, corn

middlings and standard protein-vitamin-mineral ration supplement which included sunflower and soybean meal.

In the main period during 120 days, the control group of animals received analogous ration. Heifers of experimental group received the new ration wich optimized by protein-vitamin-mineral supplement mixed fodder for protein, vitamins A and D and macro- and microelements (25% by weight, to replace sunflower, soybean meal and fodder yeast) with inclusion extruded feed beans, rapeseed meal, wheat bran and corrected for the deficiency minerals and fat-soluble vitamins (sodium, sulfur, zinc, cobalt, copper, iodine, vitamin A and D).

With the purpose of controlling some aspects of heifer metabolism 3 most expressed analogues in each group of animals were selected and rumen contents (after two hours of first morning feeding).

Chemical composition and nutritional value of fodder defined by conventional methods zootechnical analysis [6, 9]. Determination of mineral composition of feed conducted by standard methods [9, 10, 11]. Control of the live weight dynamics of the heifers was performed monthly by personal weighing. In the rumen contents were determined: pH – ionometrically, ammonia – by Conway, amylolytic, proteolytic and cellulolytic bacteria content – on selective medium [12-15]. Determination of crude bacterial mass by fractional centrifugation performed. Obtained digital material statistically processed.

Results. Feeding of standard and experimental protein-vitamin-mineral supplement as part of mixed fodders on a silage-concentrate ration differently affected species, quantitative symbiotic microflora population of rumen heifers and its functional activity (Table. 2).

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

Rates	Group	
	control	experimental
pH	6,50±0,10	6,13±0,12*
Ammonia, mg%	23,68±0,24	20,81±0,86*
Number of bacteria million / ml:		
amylolytic	10,8±0,09	11,03±0,30**
cellulolytic	8,60±0,30	10,98±0,31**
proteolytic	3,40±0,25	3,67±0,08
Crude bacterial mass, mg/100ml	1619,0±76	2293,0±163*

dry matter bacteria mg / ml	179,0±7,0	264,0±9,0**
Enzymatic activity:.		
amylase standard units	1,61±0,124	2,54±0,086**
cellulolytic%	16,54±0,55	21,43±1,21
proteolytic, mEq. tyroz. at 100 ml / min	0,240±0,017	0,264±0,009

As it is known, the concentration of hydrogen ions (pH) in rumen liquid is an integral factor which determines direction and intensity of the fermentation processes, the number and the species composition of rumen microflora, its activity, the degree of organic acids formation and the speed of their absorption [1].

It was established that the pH of rumen of research heifers after two hours for feeding was significantly lower than in controls ($p < 0.05$). In connection with this obviously that the majority of the ammonia molecules moving in the form of ammonium ion,, slowly absorbed from the of rumen microflora and better assimilated, which indicate significantly ($P < 0.01$) increased number of amilo- and cellulolytic bacteria and a tendency to increase in the number proteolytic. In this aspect our data are consistent with the authors of [7]. Along with increasing number significantly ($p < 0.01$) increased amylase enzyme activity of microflora and a tendency to increasing cellulolytic and proteolytic activities.

High content amilo-, cellulolytic- and proteolytic bacteria in the stomach is evidence of microbial protein synthesis intensification and crude biomass microflora accumulation. Active accumulation of microbial protein in the rumen of experimental heifers effected on the intensity of their growth (Table. 3).

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

Rates	Group	
	control	experimental
Live weight, kg		
at the beginning of the experiment	289,14±1,27	290,3±1,24
at the end of the experiment	386,6±1,24	390,8±1,30
growth	97,5±1,57	106,5±1,27
general, kg	650±13,52	710±10,49
average, g	100	109,2

Thus, the average daily live weight of heifers receiving the experimental protein-vitamin-mineral supplement amounts 710 g, and were to 9.2% higher than in controls (650 g).

Conclusions and prospects of subsequent researches. Thus, using of the experimental protein-vitamin-mineral supplement contributes to microflora of rumen heifers necessary nutrients, which indicates increasing the enzyme activity and microbial populations.

Optimization of rumen metabolism the final result contributed to improving average daily increase in body weight of experimental heifers by 9.2% compared to control.

Further perspective direction is investigating efficiency of heifers feeding by optimized protein-vitamin-mineral supplement based on local sources of vegetable protein.

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