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THE EFFECT OF FEED ADDITIVE RUMIFOS ON THE STRUCTURE OF DIGESTIVE ORGANS OF YOUNG CATTLE

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Abstract

It has been established that introduction of feed additive Rumifos having prebiotic effect in the amount of 1 ml/25 kg of the live body weight per day in the diet of young cattle has no probable effect on the stomach weight, but contributes to probable growth of the rumen wall thickness by 16.9% and the reticulum – by 18.4% under possible reduction of the abomasum wall thickness by 9.3% mainly due to the mucous membrane that has decreased compared with the control group by 12.6%, which may indicate a growth of absorbing capacity of the organism under the effect of prebiotic preparation.

Keywords: prebiotic, young animals, feeding, fattening, stomach, rumen, abomasum, cattle

Introduction. Modern technology of livestock production is impossible without full-value balanced animal nutrition [1, 2]. At the same time rational use of feeds is also important owing to the use of prebiotic preparations [4].

Application of prebiotic preparations and their analogues ensures, to a certain extent, normalization of energy, protein, vitamin and mineral nutrition of animals and helps to prevent disorders of the digestive system and improve feed conversion. That is why improvement of the technology of cattle feeding through the application of natural feed additives is one of the priorities that ensures improvement of the nutritional value of mixed feeds and feed mixtures, maximizing animal performance and getting environmentally friendly livestock products [1].

Prebiotics make up a relatively new group of feed additives that has not been finally formed and defined, and therefore it requires changes in management practices as well as strict control of the intestinal microflora of animals and their general health status [5].

Researched feed additive Rumifos having prebiotic effect is a low-molecular hydrolyzate of biologically active substances of wheat, barley, maize and oats. As a result, Rumifos contains sugars, mono-, di- and oligosaccharides, phenols, phenolic and aromatic acids, amino acids, heterocyclic compounds, enzymes and phyto-hormones.

Biologically active substances included in a feed additive affect the formation of biocenosis of gastro-intestinal tract, stimulate and maintain normal intestinal microflora, increase fermentation in the rumen, stimulate the synthesis of vitamins and multiplication of bifidus bacteria in the intestine, provide high level of feed digestion, peristalsis of intestine walls, regulate pH, inhibit the growth of pathogenic microorganisms, enhance immunity to infectious diseases.

The aim of this work was to investigate, along with the study of productivity, the effect of Rumifos on the structure of the rumen, omasum, reticulum, abomasum and glands of young cattle.

Materials and methods. The studies were conducted in two groups of young cattle, each having 20 animals chosen by the principle of analogy. After 15-day period of comparison, animals of the second comparative group were fed basic diet and prebiotic in the amount of 1ml/25 kg of the live body weight in the composition of the whole milk and skimmed once a day for 184 days.

1. Scheme of the experiment

Groups	Number of animals, heads	Characteristics of feeding periods	
		Comparative, 15 days	Basic, 184 days
1 (control)	20	BD*)	BD
2 (experimental)	20	BD	BD + Rumifos 1 ml / 25 kg of live weight daily

BD - basic diet*

Live weight of the experimental animals was determined by individual weighing at the beginning and at the end of the comparative and basic periods of the experiment as well as monthly. Animals were kept in groups in the typical housing along with other animals.

After the basic period of the experiment a control slaughter of four heads per group was conducted. The stomach of slaughtered animals was dissected, separated by the compartments, emptied from the contents and weighed. After visual evaluation of the mucous membrane of the rumen from the central part of the ventral sac, where papillae were developed most of all, the samples of the wall sized 10-15 cm^2 were cut and fixed in 10 percent neutral formalin. Wall thickness, including mucous and sero-muscular membranes, as well as the width and height of the papillae were studied using stereoscopic microscope MBS-9. Number of papillae per $1cm^2$ was determined by papilla calculation on the part of mucous membrane sized 6x6 cm. The absorbing surface of the papillae was determined by multiplying height to width and ratio1.64 was deduced experimentally. In the reticulum there were determined the same structures as in the rumen, but the size and height of the cells were set as well. Leaf thickness and papilla size were examined in the omasum. The size of the wall membrane and folds of the mucous membrane were valued in the abomasum. When studying the liver, general histostructure, the size of the nuclei of hepatocytes, quantity per 1 mm^2 were determined with the help of graticule and ruler on microscope Granum R60-Lux. Examination of the pancreas was similar to the study

of the liver. Biometric processing of digital material was conducted after M.O.Plokhinsky [6].

Results of research. According to the research results, average daily weight gain of animals in the experimental group was 118 g or 13.3% higher than average daily gain in the control group. This contributed to a probable increase in the absolute gain by 21.7 kg, resulting in the increase of the final live weight by 21.0 kg or 9.6%.

The results of the control slaughter indicate that the weight of the rumen in the experimental group incredibly increased by 10.2% due to possible thickening of the rumen wall by 16.9%, which grew mainly due to the mucous membrane, which in its turn exceeded the benchmark by 17.1% (Table. 2).

This may be a consequence of the fact that application of Rumifos increased the amount of positive microflora, which took active part in the digestibility of the diet nutrients as well as their better assimilation. It is proved by the increase in the number of papillae per 1 cm^2 by 7.4%, and growth of papilla height and width by 19.8 and 7.2% respectively. All these may indicate an increase in the area of absorption.

2. Morphological parameters of the rumen. M±m, n=4

Parameters	1 (control)	2 (experimental)
Weight, kg	7,45±0,94	8,21±0,84
Wall thickness, mm	5,31±0,14	6,21±0,12**
including sero-muscular, mm	4,19±0,76	4,90±0,05
mucous membrane, mm	1,12±0,05	1,31±0,04*
Number of papillae per 1 cm^2, units.	54±6	58±8
Size of papillae:		
height, mm	6,56±0,18	7,86±0,13***
width, mm	2,22±0,04	2,38±0,04*

** P>0,05; ** P>0,01; *** P>0,001*

As evidenced by morphological studies of the reticulum and omasum, corresponding organs responded by probable increase in all structures, which may indicate adaptation of these organs both to higher functional activity and adaptation to a new exocrine stimulus (Table. 3).

3. Morphological parameters of the stomach compartments. M±m, n=4

Parameters	1 (control)	2 (experimental)
Reticulum		
Weight, kg	0,943±0,12	0,954±0,11
Wall thickness, mm	5,34±0,16	6,32±0,11***
including sero-muscular, mm	3,56 ±0,10	3,95±0,13*
mucous membrane, mm	1,78±0,04	2,37±0,03***
Height of the cell, mm	14,5±0,25	15,8±0,22**
Diameter of the cell, mm	12,7±0,19	13,1±0,15
Thickness of the reticulum cell, mm	0,88±0,01	0,92±0,01*
omasum		
Weight, kg	3,38±0,33	3,42±0,29
Number of papillae per 1 cm^2, units	36±4	38±3
Height of papillae, mm	9,4±0,21	10,7±0,19**
Diameter of papillae, mm	0,72±0,01	0,76±0,01*
Thickness of the leaf, mm	0,84±0,17	0,75±0,16

Abomasum of both polygastric and monogastric animals performs the role of the stomach. As it is shown by morphological studies, feeding Rumifos contributed to probable reduction of the wall thickness by 9.3%, mainly due to the mucous membrane, which has decreased compared with the control group by 12.6%. This may indicate an increase in the absorbing capacity of the organism under the influence of prebiotic preparation Rumifos (tab. 4).

4. Morphological parameters of the abomasum. M±m, n=4

Parameters	1 (control)	2 (experimental)
Weight, kg	1,32±0,15	1,43±0,11
Wall thickness, mm	3,44±0,05	3,12±0,06**
including sero-muscular, mm	1,45±0,03	1,38±0,02
mucous membrane, mm	1,99±0,03	1,74±0,04**
Height of the folds	4,33±0,21	4,28±0,19

Conclusions and prospects for further research. 1. Introduction of feed additive Rumifos having prebiotic effect in the amount of 1 ml/25 kg of the live body

weight per day in the diet of young cattle has no probable effect on the stomach weight as a whole and its compartments in particular.

2. Morphological parameters of the rumen responded by probable increase in the wall thickness by 16.9% mainly due to the mucous membrane, which exceeded the benchmark by 17.1%; similar respond was observed in the structures of the reticulum and omasum.

3. Abomasum responded to exocrine stimulus by probable reduction of the wall thickness by 9.3% mainly due to the mucous membrane, which decreased compared with the control group by 12.6%.

Further studies will be aimed at studying the effect of prebiotic on digestibility of essential nutrients and nitrogen balance.

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