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ЗМІНИ СТРУКТУР РУБЦЯ БУГАЙЦІВ ЗАЛЕЖНО ВІД УМОВ ГОДІВЛІ

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CHANGES IN THE RUMEN STRUCTURES OF BULLS DEPENDING ON THE FEEDING CONDITIONS

Аннотація

Фізіологічна особливість травної системи жуйних використовувати у рубці небілковий азот і перетворювати його в білковий робить можливим застосування кормових добавок, що містять небілковий азот. Безазотисті кормові добавки мають в своєму складі цінні макро- і мікроелементи, що приймають участь у обмінних процесах організму і забезпечують формування продуктивності тварин.

Обґрунтування формування продуктивних якостей молодняку великої рогатої худоби, що вирощується на м'ясо, пов'язаних з пристосуванням організму тварин до різних кормових добавок, є актуальною проблемою у тваринництві. А вивчення структур рубця, їх ступеня пристосованості до нового кормового фактору представляє науковий і практичний інтерес.

Abstract.

The physiological feature of the digestive system of ruminants to use non-protein nitrogen in the rumen and convert it into protein makes it possible to use feed additives containing non-protein nitrogen. Nitrogen-free feed additives contain valuable macro- and microelements that take part in the body's metabolic processes and ensure the formation of animal productivity. Justification of the formation of productive qualities of young cattle raised for meat, associated with the adaptation of the animal body to various feed additives, is an urgent problem in animal husbandry. And the study of rumen structures, their degree of adaptation to the new feed factor is of scientific and practical interest.

Ключові слова: *рубець, бугайці, небілковий азот, кормові добавки, продуктивність, годівля, сосочки, слизовий шар, товщина стінки.*

Keywords: *rumen, bulls, non-protein nitrogen, feed additives, productivity, feeding, papillae, mucous layer, wall thickness.*

Introduction.

The rumen is the initial section of the four-chambered stomach of ruminants, the largest of the four, reaching 4/5 of the total stomach volume in adult animals. The scar can be compared with a highly efficient system of continuous cultivation of anaerobic microorganisms - a bioreactor. The development of numerous and diverse microflora of the scar is facilitated by comfortable environmental conditions of this organ. The temperature is constantly maintained at 38–42 ° C, and the continuous secretion of paratoid saliva provides a constant amount of fluid and pH at the level of 6-6.5. The constant ionic composition is determined by the metabolic function of the rumen wall and the continuous secretion of saliva [12].

Regular intake of animal feed provides a constant nutrient medium for microorganisms. The products of microbial fermentation are constantly absorbed through the wall of the scar and their presence does not interfere with the action of microbial enzymes. The formation of carbon dioxide, methane, ammonia, hydrogen and hydrogen sulfide creates anaerobic conditions. Simply put, a ruminant in a certain area of its esophagus has created a farm for bacteria and ciliates and a greenhouse for fungi, qualitatively cultivates and grows them, and then kills and digests in its enzymatic tract [11, 14].

Due to the presence of numerous microflora (bacteria, ciliates and fungi) in the rumen, plant feeds undergo complex mechanical and enzymatic processing. Under normal conditions, the rumen contains from 2 to 4 kg of microorganisms with a density of up to one million per gram. Different types of microflora specialize in the breakdown of individual parts of the feed and the use of appropriate nutrients. Quantitative and species composition of the microflora in the rumen depends on many factors, of which feeding conditions are of paramount importance. With each change in diet, the microflora changes at the same time, so for ruminants, the gradual transition from one type of diet to another is especially important [12, 14].

Analysis of research and publications.

About half of the time required for digestion, food is in the rumen (from 12 to 18 hours out of a total of 24-36 hours). Poorly digestible food stays in the rumen for a long time, which, in turn, limits the amount consumed and receive the necessary nutrients. In the rumen under the action of enzymes of microorganisms, the membranes of plant cells are destroyed, the feed is prepared for further processing by rennet enzymes. During fermentation, gases are formed in the rumen, and when the rules of feeding animals are violated, they accumulate a lot and a dangerous disease can occur - swelling of the rumen (tympani).

The main function of the rumen is the digestion of feed fiber due to the cellulosolytic activity of populations of microorganisms. This allows cattle and all ruminants to exist and produce, consuming only coarse fibrous feed. In ruminants, feed is broken down and used by the microflora to meet its nitrogen needs, and the microbial protein produced in the rumen is the main source of protein for the animal. As a result, low-quality plant feed proteins become complete and can be used by the animal's body. The diet of ruminants consists mainly of plant foods that contain from 4 to 70% crude protein. The amount of non-protein nitrogen is from 10 to 30% of the total nitrogen of plants. It is represented by free amino acids, purine and pyrimidine bases, peptides, amides, nitrates, choline, betaine, urea and ammonia [2, 8].

Up to half of the daily nitrogen of the feed is absorbed in the form of ammonia in the rumen. The degree of protein breakdown in the rumen depends on how different its amino acid profile is from the ideal one. The greater the deviation, the more energy is required for the synthesis of scar protein. The worse it is, the more ammonia will get to the liver, which should convert it into a low-toxic form - urea. If there is little urea, it will go through the hepatoruminal tract and return to the rumen through saliva or by diffusion through the walls of the rumen. Excess urea is excreted through the kidneys. This leads to unproductive energy consumption and nitrogen loss [7, 17].

The microflora of the rumen is also able to absorb non-protein nitrogen of the feed. When most of these compounds decompose, ammonia is formed. Ammonium salts when introduced into the rumen are easily hydrolyzed to form ammonia. The urea in the rumen is exposed to the enzyme urease, which is produced by various microorganisms. Urea, which comes from the blood, is 60-100% hydrolyzed by the rumen mucosa. This is due to the presence of bacterial urease in the epithelial layer of the mucosa and the ability of ammonia to pass through the mucosa of the rumen faster than urea [6, 12].

All components of a rumen microflora (large and small bacteria, the simplest) have proteolytic activity. The protozoa use nitrogen obtained by hydrolysis of bacterial cell proteins. Absorption of ammonia from the digestive tract into the blood, the formation of urea in the liver, its reabsorption in the renal tubules and subsequent return to the rumen with saliva or through the mucous membrane is called ruminohepatic circulation of nitrogen. With a sufficient amount of easily digestible carbohydrates improves the use of feed nitrogen, increases the synthesis of microbial protein. Optimal conditions for protein synthesis are when 10-100 g of easily available carbohydrates per 10 g of nitrogen in the diet. Cicatricial microflora synthesizes all essential and non-essential amino acids. That is why it is widely believed that ruminants are less sensitive to amino acid deficiency in the diet. In fact, the amino acids synthesized by the microflora are sufficient to meet the needs of animals with low and medium productivity under normal feeding and housing conditions. But it is not enough to ensure the normal growth and development of young animals or high milk productivity of animals. Also, the degree of synthesis of different amino acids is not the same. Limiting amino acids for growing young are methionine, lysine and threonine [4, 6].

Methionine is a critical amino acid for high-yielding cows, so providing it to animals is important for quality products, improved reproduction and health. However, the narrow range of feeds in the diet and their poor quality lead to a deficiency of digestible protein and methionine. Currently, there is a revision of the existing assessment of protein feeding and the development of a more sophisticated system based on modern knowledge of the physiology of digestion of ruminants. A new approach to the normalization of protein feeding is based on the fact that the need of ruminants for nitrogen is met by amino acids absorbed in the small intestine. Control over the content of crude and digestible protein without taking into account the breakdown in the rumen does not meet the real needs of the animal body and leads to overuse of feed protein, higher prices and metabolic disorders [6, 12].

The ability of a number of rumen microorganisms to absorb simple nitrogen compounds is the basis for the widespread use of synthetic nitrogen-containing compounds in the feeding of ruminants. But we must not forget that such a synthesis requires additional energy (approximately equivalent to 600 g of corn), available sulfur and other trace elements in the form of a premix. Up to 25% of protein in cattle diets can be replaced by synthetic nitrogen compounds such as urea, ammonium salts and the like. There is one problem: urea (still called "wild protein" in the literature) gives off ammonia very quickly, so its level must be constantly monitored. If the diet of ruminants contains excess digestible protein, or its amount is unbalanced with the energy-cleavable components of the feed, or the amino acid profile of the digestible protein deviates too much from the ideal, the rumen produces too much ammonia. Excess ammonia enters the blood through the walls of the rumen, and from there into the liver, where it is converted into urea. When too much ammonia enters the blood and there is not enough energy to enter the body with food, or when the liver is sick (fatty degeneration, helminths, etc.), all ammonia is not converted to urea and its concentration in the blood increases. This leads to toxicosis, weakening of immunity and, as a consequence, an increase in morbidity [1, 12].

Materials and research methods.

In order to obtain high-quality planned products from farm animals, it is necessary to provide them with complete feeds - feeding rations must be balanced with all the necessary nutrients. Scientists believe that the search for and use of new feed additives is an effective way to enrich feed rations [10, 15].

The problem of protein deficiency in the diets of ruminants, the physiological feature of their digestive system to use non-protein nitrogen in the rumen and convert it into protein makes it possible to use a feed additive that contains non-protein nitrogen [6, 10, 16].

Feed additives containing non-protein nitrogen in these studies are:

- mineral-ammonium preparation MP-15;
- phosphorous liquid feed additive (FRKD);
- mineral additive based on saponite;
- steamed modified molasses brew.

Nitrogen-free feed additives contain many valuable macro- and microelements that take part in the body's metabolic processes and ensure the formation of animal productivity [5]. The experiments used: zeolite Sokyrnytsky deposit (Transcarpathian region), which was fed in the final period of fattening, as well as for a long time, starting from one month of age; a mixture of zeolite with carboxylin and a mixture of zeolite with pectofoetidine.

Results and its discussion.

Recommended norms of the drug MP-15 for cattle in pulp and silage rations - 130 g per 100 kg of live weight. Feeding the drug MP-15 to bulls helped to increase the average daily gain of animals by 117 g or 14.1%, as well as reducing feed consumption per 1 kg of growth by 1.19 feed units (12.4%).

Temporal changes in the structures of the rumen of bulls in the process of adaptation to MP-15 occurred due to the increase in the thickness of its wall during the first three decades of feeding the drug, as well as after 50-110 days of its consumption (P≤0,001) (table 1). But if thickening of a wall of a rumen in the first month occurred at the expense of increase in a mucous layer at longer influence of drug on a pancreas this process occurred both at the expense of a mucous and serous-muscular layer (P≤0,05-0,001).

Phosphorus liquid feed additive (FRKD) was fed 1-1.5 liters per head per day in diluted water. The use of FRKD fattening bulls in pulp and silage type of fattening for 119 days provided an average daily gain of 131 g (14.8%) more, and feed costs per 1 kg of live weight gain, respectively, less than 0.81 feed units %).

Table 1

Macrostructure of the rumen wall of bulls in the process of adaptation to MP-15

Duration of feeding, days	Thickness of a wall of a hem, mm	Thickness of a mucous layer, mm	Thickness of a serous and muscular layer, mm
0	4,09±0,13	2,00±0,06	2,83±0,09
10	6,80±0,10***	2,96±0,08***	3,02±0.08
20	5,82±0,11***	2,55±0,09***	3,08±0,11
30	5,73±0,16***	2,78±0,12***	2,89±0,10
40	5,73±0,16	1,89±0,08	2,95±0,09
50	5,43±0,08***	2,23±0,09*	3,12±0,07*
70	7,15±0,14***	2,35±0,08***	4,59±0,11***
80	6,07±0,25***	2,66±0,13***	3,27±0,14*
110	5,80±0,14***	2,31±0,08**	3,40±0,10***

Note: * - P<0,05;** - P<0,01; *** - P<0,001.

Feeding FRKD caused an increase in both the entire wall of the rumen and its individual layers. Curves characterizing changes of a mucous and seromuscular layers in all periods were above preadaptation level, except for a mucous layer which thickness slightly decreased to the first 9 days of adaptation to an additive (tabl. 2). The curve of changes of a serous and muscular layer is characterized by emergence of positive extremes on the 9th and 36th days of adaptation to a supplement and negative - on the 18th and 45th days, ie with an interval of 27 days. The thickening of the mucous membrane of the rumen wall occurs after a 9-day period of consumption of the supplement 58 and up to 45 days, after which the curve falls down, forming only one positive extremum.

Table 2

Macrostructure of the rumen wall of bulls during feeding FRKD

Duration of feeding, days	Thickness of a wall of a hem, mm	Thickness of a mucous layer, mm	Thickness of a serous and muscular layer, mm
0	3,54±0,08	1,52±0,06	2,04±0,05
9	4,09±0,0,06	1,44±0,04	2,72±0.04
18	4,12±0,10	1,70±0,07	2,42±0,05
27	4,34±0,09	1,73±0,16	2,67±0,06
36	5,97±0,09	1,98±0,06	4,00±0,06
45	4,99±0,12	2,73±0,08	2,29±0,06
54	5,27±0,11	1,86±0,07	3,39±0,12

The mineral supplement based on saponite was fed to animals in the amount of 35 g per feed unit in summer and winter. Its introduction into the diet of bulls caused profound structural changes in the rumen. With a slight increase in the mass of the rumen, its wall thickness decreased by 48.7%. Compensation of rumen function was not observed, although with a decrease in the linear measurements of the papillae (height and width), their number increased. In general, the suction surface of the membrane was reduced (table 3).

Evaporated modified molasses brew was fed in the amount of 2 kg in addition to the diet.

The study of the condition of the rumen from experimental animals indicates an increase in its mass (P

<0,05), wall thickness (P <0,001) due to hypertrophy of the mucous and serous-muscular membranes (table 4). When the papillae height decreases with a probable difference (P <0.001), their width slightly increases, which leads to the preservation of the suction surface of one papilla at the control level. The number of papillae per 1 cm increases, which accordingly increases the suction surface of 1 cm of the mucous membrane of the rumen (fig. 1).

Table 3

Morphological parameters of the rumen of bulls for feeding a mineral supplement based on saponite

Indicators	Groups	
	1 - control	2 – experimental
Weight, kg	7,48±1,21	8,92±0,52
Wall thickness, mm	5,73±0,20	2,94±0,28**
incl. mucous membrane, mm	1,77±0,21	1,06±0,22
serous-muscular, mm	3,91±0,17	1,87±0,25**
The number of papillae per 1 cm ², pcs.	34,5±9,3	45,2±8,9
Height of papillae, mm	8,96±0,11	6,39±0,14***
Nipple width, mm	2,97±0,19	1,71±0,11***
Suction surface: 1 papilla, mm ²	26,6	18,0
1 cm ² mucous rumen, mm ²	918,1	439,9

Note: **- P<0,01; *** - P<0,001.

Thus, feeding modified molasses brew to bulls from the end of the milking period to slaughter condition led to hypertrophy of the membranes of the rumen wall and an increase in the absorption surface of 1 cm mucosa, which may indicate increased functional activity of this organ compared to control.

Zeolite and carboxylin were studied as nitrogen-free feed additives in the diet of animals.

The bulls of the experimental group in addition to the main diet received zeolite at the rate of 20 g per 1 feed unit of the diet. Studies have shown that the adaptation of bulls to the diet with zeolite was accompanied by significant changes in the structures of the rumen (table 5). In the first 10 days of feeding zeolite there was a thinning of the rumen wall (P≤0.05), which occurred mainly due to the serous-muscular layer. By day 17, the size of the rumen wall was set to the control level, then by day 24 it increased again (P≤0.01). The following week, by day 31, it was

Table 4

Morphological characteristic of the rumen for experimental bulls in the case of trivial growth of the modified mash

Indicators	Groups	
	1 - control	2 – experimental
Weight, kg	5,80±0,26	7,00±0,85*
Wall thickness, mm	3,19±0,18	4,23±0,27***
incl. mucous membrane, mm	0,90±0,15	1,37±0,19*
serous-muscular, mm	2,29±0,17	2,86±0,24**
The number of papillae per 1 cm ², pcs.	34±4	39±3
Height of papillae, mm	7,36±0,08	6,68±0,09***
Nipple width, mm	2,02±0,08	2,18±0,28
Suction surface: 1 papilla, mm ²	23,79	23,30
1 cm ² mucous rumen, mm ²	797	898

Note: * - P<0,05;** - P<0,01; *** - P<0,001.

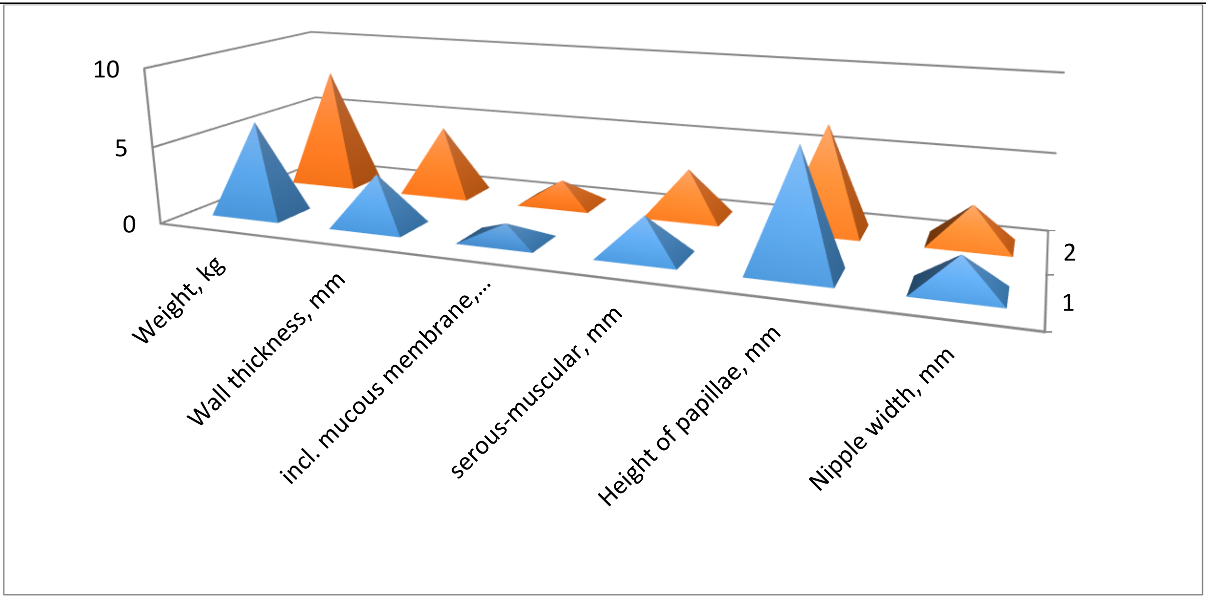

Figure 1. Morphological parameters of the rumen.

Table 5

The macrostructure of the rumen wall of bulls in the process of adaptation to zeolite

Duration of feeding, days	Thickness of a wall of a hem, mm	Thickness of a mucous layer, mm	Thickness of a serous and muscular layer, mm
0	6,23±0,30	2,00±0,15	4,57±0,26
10	5,47±0,17*	2,96±0,11	3,59±0,15**
17	6,99±0,29	2,55±0,17***	4,07±0,25
24	7,43±0,25	2,78±0,17*	4,97±0,14
31	6,23±0,20	1,89±0,12	4,09±0,14
38	7,89±0,27***	2,23±0,19	4,85±0,17
45	7,17±0,23*	2,35±0,11**	4,73±0,22
52	7,01±0,25*	2,66±0,23**	4,43±0,14
62	7,73±0,25***	2,31±0,24***	4,35±0,14
72	6,03±0,21	2,30±0,15**	3,65±0,12**

Note: * - P<0,05;** - P<0,01; *** - P<0,001.

approaching the control value. That is, changes in the thickness of the wall of the scar during the first month of feeding zeolite took place in waves with around seven-day intervals. During the second month, the wall of the rumen was thickened, after which its size again approached the initial level. The corresponding changes occurred mainly due to the mucous membrane, which was in a swollen state, except for 10 and 31 days, when its value was at the control level. In the serous-muscular membrane of the rumen wall, structural changes occurred only in the first 10 days of feeding zeolite and after 72 days and were involutional in nature.

Given the positive properties of zeolite, as well as the known productive effect of carboxylin and pectofoetidine, it was planned to study the effectiveness of their combined use as a mineral additive for fattening bulls. The daily norm of carboxylin - 20 g per 100 kg of live weight of bulls, pectofoetidine - 1 g per feed unit of the diet while maintaining the daily dose of zeolite - 20 g per 1 feed unit.

Adaptive changes in the macrostructure of the rumen wall of bulls due to the duration of feeding a mixture of zeolite with carboxylin manifested as follows: there was a significant increase in the rumen wall, including mucous and serous-muscular layers by the end of the first 10 days of feeding additives (P <0,001) . Then for 10 days, the morphogenesis of the structures of the rumen wall had the opposite direction and the significance of the difference decreased by two orders of magnitude (P <0.001). In the next 10 days, the morphogenesis of the structures of the rumen wall had the opposite direction and the reliability of the difference decreased by two orders of magnitude (table 6).

Table 6

Macrostructure of the rumen wall of bulls by feeding zeolite with carboxylin

Duration of feeding, days	Thickness of a wall of a hem, mm	Thickness of a mucous layer, mm	Thickness of a serous and muscular layer, mm
0	5,07±0,15	1,96±0,11	3,07±0,08
10	6,69±0,21**	2,97±0,17***	3,61±0.14***
20	5,65±0,16*	2,28±0,12*	3,27±0,11
30	4,39±0,18**	1,93±0,11	2,37±0,13***
40	6,27±0,18***	2,18±0,13	4,07±0,11***
50	5,83±0,20**	2,27±0,16	3,55±0,10***
70	6,05±0,17***	2,13±0,12	3,91±0,13***
80	4,85±0,13	1,94±0,10	2,99±0,09
110	5,46±0,24	1,95±0,14	3,35±0,20

Примітка: * - P<0,05;** - P<0,01; *** - P<0,001.

After another 10 days, ie up to 30 days of consumption of the supplement in the rumen wall, involutionary changes were observed, which occurred due to the serous-muscular layer. The size of the mucous layer of the rumen during this period was the same as in bulls that did not receive supplements. Over the next 4 decades of feeding the mineral mixture, the wall of the bull's rumen was thickened, but mainly due to the serous muscle layer. At 80-110 days, a significant difference in the size of the wall of the rumen and its layers between groups of bulls with the addition of diet and without it was not observed.

Enrichment of summer rations of fattening bulls with zeolite and pectofoetidine according to the following scheme - one group of animals received only zeolite in the amount of 20 g per feed unit (2 experimental), another - only pectofoetidine - 1 g per feed unit (3 experimental) and another group - zeolite with pectofoetidine in the doses indicated above (4 experimental).

A relatively deep restructuring took place in the macrostructure of the rumen wall. At feeding of zeolite in a pure kind (2 group) the thickness of a wall of a hem at the expense of a serous and muscular cover decreased. The decrease in the number of papillae was accompanied by their growth in width, which is a phenomenon of compensation of function. As a result, the suction function of the rumen was at the level of control animals. Feeding of zeolite with pectofoetidine to animals of the 4th group had a similar effect, while pectofoetidine in the diet of bulls of the 3rd group affected the reduction of the suction surface of the rumen mucosa, which occurred by reducing the number of papillae and their height (table 7).

Conclusion.

The use of feed additives in cattle feeding can be considered as exogenous factors influencing the nutrition of animals and depends on the composition, quantity and duration of feeding the additive during the growing period for meat. Feed additives affect the structural reorganization of the digestive system, which is associated with metabolic processes in the body, which ensure the formation of animal productivity in a particular environment.

The study of the productivity of young cattle in connection with the adaptation to different feed additives makes it possible to trace the relationship between the productive qualities of feeding the feed additive and structural changes in the digestive system to ensure homeostasis in the created feeding conditions.

Таблиця 7

Морфологічні показники рубця бичків за згодовування цеоліту з пектофоєтидином

Indicators	Групи			
	1-control	2-experimental	3-experimental	4-experimental
Weight, kg	5,95±0,19	6,24±0,19	6,14±0,18	5,92±0,52
Wall thickness, mm	5,70±0,08	5,36±0.09***	5,72±0,14	5,19±0,12***
incl. mucous membrane, mm	2,71±0.08	2,90±0,08	2,58±0,13	2,83±0,13
serous-muscular, mm	2,96±0,05	2,41±0,1***	3,25±0,06	2,46±0,04***
The number of papillae per 1 cm ², pcs.	47,5±8.2	31,4±6,6	40,2±2,2	39,2±5,4
Height of papillae, mm	7,9±0,15	11,3±0,08***	7,5±0,13*	10,7±0,19***
Nipple width, mm	2,4±0,05	2,7±0,06***	2,4±0,04*	2,6±0,19***
Suction surface: 1 papilla, mm ²	18,97	30,48	17,69	27,60
1 cm ² mucous rumen, mm ²	901	957	711	1082

Примітка: * - P<0,05; *** - P<0,001.

Literature:

1. Анакина Ю.Г. Регулирование продуктивности животных. Вестник сельскохозяйственной науки. 1986. № 1. С.139-140.

2. Блинов В.И., Дудина В.М., Алиев А.А. Влияние энергетических добавок на желудочный обмен липидов, отложение азота и прирост живой массы бычков на откорме. Сб. науч. тр. ВНИИ физиол., биохимии и питания с.-х. животных. Боровск, 1986. Вып.33. С. 47-55.

3. Бурлака В.А., Биба А.Д., Гудаков Л.В. и др. Цеолитовый наполнитель в премиксах для бычков на откорме. Пути снижения расходов зерновых концентратов при производстве говядины: тез.

докл. науч.- практ. конференции, 23-25 мая 1989. Белгород, 1989. С. 63-64.

4. Вридник Ф.І., Пупін І.Г., Чубко В.А. Використання небілкових азотистих речовин у годівлі худоби. Київ: Урожай, 1986. 72 с.

5. Грабовенский И.И., Калачнюк Г.И. Цеолиты и бентониты в животноводстве. Ужгород: Карпаты, 1984. 72 с.

6. Кириллов М.П. Синтетические азотистые вещества в комбикормах для откорма молодняка. Молочное и мясное скотоводство. 1981. № 11. С. 22-24.

7. Кулик М.Ф., Бабійчук М.В., Хіміч В.В. Використання синтетичних азотомістких речовин у тваринництві. Київ: Урожай, 1980. 136с.

8. Мазуренко Н.А., Юрченко В.К. Адаптативные изменения внутренних органов у бычков. Животноводство. 1985. № 6. С. 50-51.

9. Мазуренко Н.А., Печуляк В.С., Котляренко Н.П., Новак Е.Г. Минеральные добавки и результаты их использования при откорме бычков. Корма и кормопроизводство. Київ: Урожай, 1986. Вып. 22. С. 64-66.

10. Мазуренко Н.А., Курнаев А.Н., Новак Е.Г., Печуляк В.С. Сравнительная эффективность использования кормовых добавок в животноводстве. Корма и кормопроизводство. Киев: Урожай, 1988. Вып. 25. С. 64-65.

11. Паладійчук О.Р. Структурні зміни в органах травлення бичків при згодовуванні добавки з небілковим азотом. SWorldJournal. 2020. 3, part 2. С. 80-90.

12. Паладійчук О.Р. Вплив екзогенних факторів на живлення молодняку великої рогатої худоби: монографія. Вінниця: Видавництво ТОВ Друк, 2020. 144с.

13. Харди. Р. Гомеостаз. Москва: Мир, 1986. 80 с.

14. Haenal H. Intestinal flora in health and disease. Progr. Food and Nutr. Sci. 1975. V.21, N 1. P.64.

15. Roche J.F., Guirke S.F. The use of growth promoters in beef production. Irish. Veter. News. 1985. June. Suppl. P. 30-33.

16. Weekes T.E.C., Buttery P.Y., Lindsay N.D., Haynes N.B. Control and manipulation of animal growth. Butter worth. 1986. №-2. P. 187-206.

17. Weekes T.E.C. and Gootden P.M.M. Hormones and Metabolism in Ruminants. London, 1981. 110 p.

References:

1. Anakyna Yu.H. Rehulyrovanye produktyvnosty zhyvotnиkh. Vestnyk selskokhoziaistvennoi nauky. 1986. № 1. S.139-140.

2. Blynov V.Y., Dudyna V.M., Alyev A.A. Vlyianye enerhetycheskykh dobavok na zheludochnиi obmen lypydov, otlozhenye azota y pryrost zhyvoi massи bychkov na otkorme. Sb. nauch. tr. VNYY fyzyol., byokhymyy y pytanyia s.-kh. zhyvotnykh. Borovsk, 1986. Vyp.33. S. 47-55.

3. Burlaka V.A., Byba A.D., Hudakov L.V. y dr. Tseolytovi napolnytel v premyksakh dlia bychkov na otkorme. Puty snyzhenyia raskhodov zernovиkh kontsentratov pry proyzvodstve hoviadynи: tez. dokl. nauch.- prakt. konferentsyy, 23-25.05.1989. Belhorod, 1989. S. 63-64.

4. Vrydnyk F.I., Pupin I.H., Chubko V.A. Vykorystannia nebilkovykh azotystykh rechovyn u hodivli khydoby. Kyiv: Urozhai, 1986. 72 s.

5. Hrabovenskyi Y.Y., Kalachniuk H.Y. Tseolyty y bentonyty v zhyvotnovodstve. Uzhhorod: Karpatи, 1984. 72 s.

6. Kyryllov M.P. Syntetycheskye azotystиe veshchestva v kombykormakh dlia otkorma molodniaka. Molochnoe y miasnoe skotovodstvo. 1981. № 11. S. 22-24.

7. Kulyk M.F., Babiichuk M.V., Khimich V.V. Vykorystannia syntetychnykh azotomistkykh rechovyn u tvarynnytstvi. Kyiv: Urozhai, 1980. 136s.

8. Mazurenko N.A., Yurchenko V.K. Adaptatyvnиe yzmenenyia vnutrennykh orhanov u bychkov. Zhyvotnovodstvo. 1985. № 6. S. 50-51.

9. Mazurenko N.A., Pechuliak V.S., Kotliarenko N.P., Novak E.H. Myneralnиe dobavky y rezultatи ykh yspolzovanyia pry otkorme bychkov. Korma y kormoproyzvodstvo. Kyiv: Urozhai, 1986. Vyp. 22. S. 64-66.

10. Mazurenko N.A., Kurnaev A.N., Novak E.H., Pechuliak V.S. Sravnytelnaia effektyvnost yspolzovanyia kormovиkh dobavok v zhyvotnovodstve. Korma y kormoproyzvodstvo. Kyev: Urozhai, 1988. Vyp. 25. S. 64-65.

11. Paladiichuk O.R. Strukturni zminy v orhanakh travlennia bychkiv pry zghodovuvanni dobavky z nebilkovym azotom. SWorldJournal. 2020. 3, part 2. S. 80-90.

12. Paladiichuk O.R. Vplyv ekzohennykh faktoriv na zhyvlennia molodniaku velykoi rohatoi khudoby: monohrafiia. Vinnytsia: Vydavnytstvo TOV Druk, 2020. 144s.

13. Khardy. R. Homeostaz. Moskva: Myr, 1986. 80 s.

14. Haenal H. Intestinal flora in health and disease. Progr. Food and Nutr. Sci. 1975. V.21, N 1. R.64.

15. Roche J.F., Guirke S.F. The use of growth promoters in beef production. Irish. Veter. News. 1985. June. Suppl. P. 30-33.

16. Weekes T.E., Buttery P.Y., Lindsay N.D., Haynes N.B. Control and manipulation of animal growth. Butter worth. 1986. №-2. P. 187-206.

17. Weekes T.E. and Gootden P.M. Hormones and Metabolism in Ruminants. London, 1981. 110 p.

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