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Influence off easily and difficultly catabolism of carbohydrates on the composite and fermentative activeness of the paunch microflora of rams

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Abstract
Carbohydrate digestion, metabolism, and their role in the gut microbiota modulation are the focus of multiple studies. The objective of this weight of evidence systematic review is to investigate the potential relationship between ingested carbohydrates and the gut microbiota composition at different taxonomic levels. Microbial fermentation of complex non-digestible dietary carbohydrates and host–derived glycans in the intestine has important consequences for health [1]. Certain dominant species, notably among the Bacteroidetes, are known to possess very large numbers of genes that encode carbohydrate active enzymes and can switch readily between different energy sources in the gut depending on availability. The impact of dietary carbohydrates, including prebiotics, on human health requires understanding of the complex relationship between diet composition, the gut microbiota and metabolic outputs [1]. Hay and straw comprise the main course fodder in the ration of ruminants as they are rich in cellulose and contain a relatively small amount of proteins and soluble carbohydrates.
In Azerbaijan there happens a significant loss of nutrient elements during the mowing and drying process of the grass to be used for fodder. The main loss is observed in fraction of soluble carbohydrates, resulted from aerobic respiration when sugar acidates down to CO_2 and water.

Keywords: Rams, ration, carbohydrate, protein, microflora, cellulose, fistula, bacteria

Introduction
This loss is reflected on the concentration of components of the vegetable cell walls, especially cellulose and lignine. Among the compounds such as cellulose, hemicellulose, lignine, which make part of a plant, cellulose is the component carrying the major nutrient significance, and its concentration in vegetable fodder is quite high. The major location for digesting cellulose is the paunch a number of factors contribute to the degree of digestion of cellulose in the digestive system of the ruminants. These are: the extent to which plants lignine, the concentration of easily digested carbohydrates, proteins, minerals as well as the concentration of cellulose in the diet [1, 2, 3]. Sugars are simple carbohydrates and are absorbed within the first minutes after ingestion. Monosaccharides and disaccharides are types of simple CHs that are composed of one or two molecules of saccharides. The most common examples of monosaccharides are glucose and fructose, while the most common examples of disaccharides are sucrose and lactose [4].

These compounds are commonly found in fruits and are easily absorbed in the small intestine as an immediate source of energy. Disaccharides are typically hydrolyzed by enzymes present in the small intestine, but if these enzymes are not available, the compounds will reach the large intestine and be degraded by the gut microbiota [4].

Oligosaccharides, such as inulin and oligofructans, are found in vegetable sources and are not easily digestible by human enzymes in the small intestine. Instead, they reach the large intestine undigested, where their hydrolysis depends on the available glycoside hydrolases (GHs) produced by the gut microbiota. Therefore, many oligosaccharides are not digested by humans and are instead fermented by the gut microbiota [5].

Soluble fibers such as pectin, which is a water-soluble polysaccharide found in the cell walls of vegetables, are partially hydrolyzed by enzyme in the small intestine, but an important portion reaches the colon, similar to the beta-glucan, non-starch polysaccharides, found in some cereals such as barley, oats, and wheat. Arabinoxylans and xylogluccans are complex carbohydrates also found in vegetables; these also reach the large intestine undigested [6].

A wide range of carbohydrates are commonly used as food additives in order to modify the physical properties of processed foods, such as viscosity, texture, gelling, emulsifying, stabilizing, and crystallization control, among others. These long-chain polymer carbohydrates are classified as hydrocolloids.

Digestion of cellulose is impossible without the microflora of paunch. To provide their growth and reproduction the microorganisms of paunch need easily-digested carbohydrates. In the course of their lives they accumulate easily-digested. Protein of full value and glicogenic polysacaharides and finally are used for feeding process. By changing the ratio of easily and not easily decomposed carbohydrates in the diet of the animals both the common characteristics of paunch processes and the level of utilization of cellulose can be altered [4, 5, 6]. Thus, the task set was to study the generals amount of bacteria and cellulosolitic activeness of paunch microflora at a different level of carbohydrates in the rations of rams.

Material and method statement
The tests were carried out in the farm of Azerbaijan Scientific Research Institute of stock-raising. For this purpose 3 rams of Avasi breed were selected with the weigth of 37-40 kg. The age of the ruminants is 10-12 months. Prior to the tests the rams were operated on according to Aliyev A.A.(1) and had a fistula-like device in

the paunch and a fistula device at the beginning of duodenum. 3 rations were tested.

The rations were balanced according to basic nutrient elements differing from one another only in the level of content of carbohydrates. The tests were conducted by the system of latin square, The duration of each period was 25-30 days, the gaps between periods were 7 days. The period was ended by a weeks balance test.

With the help of bacteriological and cultural methods the paunch was studied for the main groups of paunch micro-organisms and their fermentative activeness. The samples of paunch contents were taken prior to morning feeding, after 1, 3, 6, 12, 24 hours after feeding.

Results

A number of authors note that the micro-flora of paunch is a well-balanced system and feeding factors don't influence significantly its quantity. Other scientists show that the level of easily digestive carbohydrates in the diet has on influence on the bacterial density of the paunch [2, 3, 4, 6]. Our research as certain that while feeding rams with the scheduled ration the aggregate number of bacteria made 9.4 billions/ml.

Table 1: Micro-biological data of the paunch contents of the rams

Indices	Rations		
	I	II	III
Aggregate number of bacteria billions/ml	9.4	16.3	12.5
Amylolytic, mln/ml	247.8	207.2	320.3
Glycerin ferment in gmln/ml	145.0	121.4	195.1
Lynolitical, mln/ml	135.1	258.2	110.6

Feeding the experimental animals with a diet where the level of cellulose was 16,3 % higher than in the control group the aggregated number of bacteria was 6, 9 billion higher. The count of paunch bacteria of rams receiving ration III revealed that the number of bacteria made 12,5 billion/ml., i.e. 3.1 billion more than in the control group, but 3,8 billion fewer than that of the ruminants fed by ration II. Analysis of table 1 concludes that between the number of starch-hydrolytic bacteria and the level of easily fermenting carbohydrates in the diet the guantity of bacteria of this group increases (III ration).

The same was observed during the count of glycerin fermenting bacteria. The opposite was observed in the number of bacteria capable of decomposing lypoids and glycerin. The number of amylolytic and glycerin fermenting bacteria on I and III rations was the highest whereas the content of lypolytic bacteria in the paunch was less than in ruminants fed on ration II. In comparison with ration I and III their guantity was 123.1 and 147, 4mln higher correspondingly. Having studied the physiological characteristics of cellulozolytic bacteria of the paunch, scientists established the fact that these micro-organisms area able to use glucose, xylose and some use starch [8]. Besides, they prefereasily-fermented carbohydrates to cellular tissue (cellutose). As well as this, it was noted that by including some guantity of carbohydrates into the diet, additional stimulus is added to the process of breaking up of the cellulose by paunch bacteria. The studies of cellulolytic activeness of paunch microflora revealed the fact that the highest level is observed prior to morning feed.

Table 2: Cellulozolytic activeness of paunch microflora

Ration	Cellulose decomposition percentage					
	Time of sampling the paunch juice					
	Prior to morning feed	İn 1 hours	İn 3 hours	İn 6 hours	İn 12 hours	İn 24 Hours
I	13, 720, 51	12, 851, 43	10, 00,5 9	9, 310, 95	10, 750, 44	11, 640, 85
II	18, 851, 15	12, 720, 48	11, 510, 62	13, 840, 53	16, 831, 04	17, 910, 62
III	16, 440, 92	12, 100, 69	10, 44	10, 00, 62	12, 150, 73	14, 830, 85

However, the highest level of decomposition was observed with the rams fed on ration II. After the fodder intake the cellulosolytic activeness of the paunch microflora decreased and again activated 6 hours after the fodder intake. This is probably connected with evacuation of the contents of fore-stomach left over from the previous feed. As well as the the remainders of food, a considerable number of various micro-organisms including cellulozolytic, attached to the particles of fodder, are evacuated. A certain amount of time is vequired for processing (i.e. pulling to smaller pieces, chewing, maceration, seeding by micro-organisms) of the new fodder intake [9].

In about 12 hours after feeding a gradual increase of cellilozolytic activeness of micro-flora is observed, reaching its peak 24 hours after the last fodder intake. Another important thing worth mentioning is that the cellulozolytic activeness of bacteria increased only 12 hours after food intake with ruminants kept on rations I and III, where as the II ration ruminants demonstrated the cellulozolytic activeness of bacteria only 6 hours after food intake.

Conclusion

The outcome of the research conducted demonstrated that in order to provide normal development of microbe population of the paunch and conseguently, fermentative processes ongoing in it proportion of easily and heavily digested carbohydrates in the diet of ruminants has a vital importance. The results obtained through the specific methodology used in this weight of evidence systematic review reinforce previous observations suggesting that differences in carbohydrate consumption have an important role in the ram's health by impacting the composition of the gut microbiota environment.

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