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A COMPARATIVE STUDY OF THE NUTRITIONAL VALUES OF SWEETENER-ENRICHED GOAT MILK YOGHURTS.

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Modern trends in the food industry not only correspond to the advantages of consumers, but also actively focus on the development of food products that take into account the new requirements for a healthy diet. Growing interest in low-calorie foods, functional nutrition and sugar reduction is driving scientific research into substituting natural sweeteners such as traditional sugar stevia [1]. In the context of a global increase in the incidence of diabetes and metabolic syndrome, the development of products with a low glycemic index, but retaining their organoleptic and nutritional properties, is of particular importance.

Due to its composition, goat milk is a unique product. It contains digestible protein compared to cow's milk and also has a higher digestible short and medium cellular fatty acid. In addition, goat milk is a rich source of vitamins (especially vitamin A) and minerals (calcium, magnesium, phosphorus) [1]. According to research, goat milk can also be useful for people who are allergic to cow's milk protein or have problems with its absorption.

In addition, traditional yogurts, as a rule, are characterized by a significant increase in the calorie and glycemic index of added yogurts with sugar. In this regard, the use of alternative sweeteners comes first, among which *Stevia rebaudiana* is characterized by zero calories and zero glycemic index [2]. *Stevia* has long been used as a safe alternative to sugar, especially for diabetic patients or those seeking to reduce their sugar intake.

The purpose of this work is a comparative study of the nutritional value of yoghurts made from various sweeteners: stevia, sugar, fructose and goat milk with honey. We determine how the use of various sweeteners affects the caloric content, glycemic index (GI) and organoleptic properties of yogurts.

Goat milk has a number of unique characteristics that differ from cow milk. It contains such medium cellular fatty acids as caproic, caprylic and capric acids. These fatty acids are easily absorbed and have antibacterial properties. In addition, goat milk is a rich source of vitamin A, important for skin health, vision and the immune system.

An important aspect of goat milk is its hypoallergenicity. Some studies suggest that goat milk may be beneficial for people allergic to cow's milk proteins,

making it convenient for food production for people with high sensitivity to dairy products.

Stevia has long been known as a safe and effective natural sweetener used in a variety of foods. Steviolosides on the leaves of the *Stevia rebaudiana* plant are 200-300 times sweeter than sugar, while they do not contain calories and do not affect blood sugar levels. Stevia is widely used in products for diabetics, as well as for people who control the calorie content of their diet. In addition, stevia has antioxidant properties, which makes it useful for the prevention of inflammatory diseases.

Usually, sugar is added to yogurts, which makes their taste pleasant and familiar to the consumer. However, the addition of sugar significantly increases the calorie content of the product and its glycemic index. Fructose is often used as an alternative to low-calorie sugar, as it has a low GI, and also has its drawbacks associated with metabolic disorders in excess. Honey has antibacterial and antioxidant properties, but contains a significant amount of carbohydrates and has a high GI [3].

Four samples of goat milk-based yogurts were prepared for the study, each of which contains different sweeteners:

- yogurt with stevia;
- Yogurt with sugar;
- yoghurt with fructose;
- Yogurt with honey;

The nutritional characteristics of each sample are shown in Table 1. As you can see, stevia yogurt has the lowest calorie content than sugar-containing yogurt, which makes it most convenient for people who control body weight.

Table 1 - Nutritional value of goat milk yogurts (per 100 g of product)

Index	Stevia	Sugar	Fructose	Honey
Calories (kcal)	45	120	110	130
Proteins (g)	5,4	5,4	5,4	5,4
Oils (g)	5,8	5,8	5,8	5,8
Carbohydrates (g)	4,21	10,35	9	15,0
Vitamin A (mg)	0,15	0,15	0,15	0,15
calcium (mg)	120	120	120	120

The table shows that the composition of proteins and fats remains unchanged, since the main ingredient for all samples is goat milk. However, the composition of the hydrocarbons varies significantly depending on the sweetener. Stevia does not contain carbohydrates as a natural sweetener, which leads to a low calorie content of yogurt.

The glycemic index of each sample is presented in Table 2. The results of the analysis showed that the glycemic index of yogurt with the addition of stevia is minimal (0-5), which makes it an effective product for people who control blood sugar levels. We see that the product with added sugar in yogurt is higher than GI

(65), and this contributes to a sharp increase in blood glucose levels after consuming the product.

Table 2 - Glycemic index and carbon content of yoghurts with various sweeteners

Sweeteners	Glycemic index (GI)	Carbohydrates (g/100 g)
Stevia	0-5	4,21
Sugar	65	10,35
Fructose	23	9
Honey	50	15,0

The composition (CFU/g) of probiotic bacteria (*Lactobacillus acidophilus*) of each sample is presented in Table 3. Yoghurts are a rich source of probiotic bacteria such as *Lactobacillus acidophilus*. Different sweeteners can have different effects on the growth of these bacteria during fermentation. For analysis, we are conducting a study of the microbiological composition of yogurts.

Table 3 - Content of probiotic bacteria (*Lactobacillus acidophilus*) in yoghurts with various sweeteners (cfu/g)

Sweeteners	Bacterial composition (<i>Lactobacillus acidophilus</i>) (cfu/g)
Stevia	1.2×10^8
Sugar	1.5×10^8
Fructose	1.3×10^8
Honey	1.4×10^8

The organoleptic evaluation of each sample is presented in Table 4. Organoleptic analysis includes evaluation of taste, texture, aroma and color of products. These parameters are important for consumers and can affect the taste perception of yogurt with various sweeteners.

Table 4 - Organoleptic assessment of yogurts (on a 5-point scale)

Parameters	Stevia	Sugar	Fructose	Honey
Taste	3,5	4,8	4,2	4,7
Consistence	4,0	4,5	4,2	4,6
Smell	3,8	4,7	4,3	4,5
Color	4,2	4,6	4,4	4,8

The shelf life of each sample is presented in Table 5. One of the most important characteristics of products is their shelf life. Sweeteners can affect the resistance of yogurts to damage in different ways, especially in terms of mold and bacterial growth.

Table 5 - Shelf life of yoghurts (days) at + 4 °C

Sweeteners	Retention period (days)
Stevia	21
Sugar	15
Fructose	18
Honey	17

The study found that using stevia as a sweetener for goat milk yogurt can significantly reduce the calorie content of the product, while maintaining its nutritional and probiotic properties. Stevia yogurts are characterized by a minimal glycemic index, which makes them convenient for diabetics and those who follow a low-carb diet [4,5,6,7,8].

Even though sugar and honey have less organoleptic characteristics compared to sweetened yoghurts, stevia is a great alternative to healthy eating, reducing the impact on blood sugar.

The results of the conducted studies made it possible to comprehensively assess the effect of various sweeteners included in the composition of goat's milk yoghurts on nutritional value and organoleptic properties. Based on technological, chemical and microbiological analyses, the advantages of stevia as a natural sweetener have been determined, especially its zero calorie content and low glycemic index. These features significantly reduce the energy value of yogurt, making it convenient for diabetics and other consumers who need to consume foods with a low glycemic index.

During the study, it was proved that yogurt with stevia is characterized by a minimum carbohydrate content and a low glycemic index, which minimizes the effect of the product on blood sugar levels. This product is more beneficial to health than yoghurts with sugar, because it prevents a sharp increase in blood glucose levels, does not contribute to metabolic disorders and reduces the sugar load on the body.

Given the hypoallergenic properties of goat's milk, these products are an excellent alternative to cow's milk offered to people with allergies. The high content of medium chain fatty acids in goat's milk ensures its easy absorption and enhances its antibacterial properties [9]. The effect of stevia on the growth of probiotic bacteria was also analyzed and it was found that *Lactobacillus acidophilus* does not negatively affect the activity of bacteria, which is an important factor in ensuring the microbiological safety of yogurt.

The analysis of organoleptic parameters showed that stevia-sweetened yogurts have slightly lower taste properties than yogurts with sugar or honey. However, the increasing trend among consumers aimed at maintaining health and limiting sugar makes this difference insignificant. The main advantage of stevia is its low calorie content and lack of effect on blood sugar, which allows the product to be introduced into a diet aimed at improving health.

A comparative study of the shelf life of yoghurts has shown that products with the addition of stevia remain intact for a long time. This provides advantages, especially for markets where food storage safety is important.

The results of scientific research prove the effectiveness of using stevia as a natural sweetener, the possibility of its equivalence to sugar and milk.

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